APPENDIX E7

SR522 to SR 520 Project
Biological Assessment
(August 2004)

I-405, SR520 to SR522 Stage 1
(Kirkland Stage 1)

Final Package Review – 15%

January 25, 2005

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I-405 Congestion Relief and Bus Rapid Transit Projects: SR522 to SR520 Project Biological Assessment

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Summary

WSDOT is proposing to widen I-405 for a distance of eight miles from the north side of the I-405/SR520 interchange to the south side of the I-405/SR522 interchange. The project will add a northbound general-purpose lane from the I-405/NE 70th interchange to the I-405/NE 124th Street interchangeand a southbound general purpose lane from the I-405/SR 522 interchange to the I-405/SR 520 interchange. The I-405/NE 116th Street interchange will be realigned and local roadways will be modified, as necessary, for interchange improvements. Stormwater will be managed for water quality treatment and detention by upgrading conveyance systems and context sensitive design will be used to address aesthetic issues. It will be constructed as a design-build project, thus many of the details of construction are not known at this time.

This Biological Assessment (BA) analyzes the effects of the SR522 to SR520 Project (I-405 from SR 520, north to SR 522) on Endangered Species Act (ESA) listed species that may occur in the project vicinity, namely chinook salmon (*Oncorhynchus tshawytscha*), bald eagle (*Haliaeetus leucocephalus*) and bull trout (*Salvelinus confluentus).* Marbled murrelet (*Brachyramphus marmoratus*), a threatened species, and fisher (*Martes pennanti*), a candidate species, were not evaluated because they do not occur in the action area.

Forbes and Juanita Creeks and the Sammamish River pass under I-405 within the action area. No instream work is planned for any of the water bodies that may be used by chinook salmon, primarily the Sammamish River; no chinook salmon have been found to use Forbes or Juanita Creeks and there are several migration barriers both upstream and downstream of the project. For these reasons, a *may affect, not likely to adversely affect* determination was made for chinook salmon.

Bull trout/Dolly Varden use within the action area is extremely limited and likely occurs occasionally in cases when amphidromous individuals are migrating through Lake Washington. There have been very few sitings of bull trout/Dolly Varden in Lake Washington and none have been reported in Juanita Bay or any of the streams located within this project area. None of the sightings or captures has completed the analysis necessary to differentiate between bull trout and Dolly Varden. Further, the habitat that is available in any of the potentially impacted streams is unsuitable for bull trout both historically and under current baseline conditions. Given the unlikelihood that bull trout can or will use these streams, this project *may effect but will not likely adversely affect* bull trout.

For bald eagles, no nesting occurs within 1.25 miles of the project. Eagles that occur outside the action area tend to forage toward and over Lake Washington to the west of the project. The project will have *no effect* on bald eagles.

Acronyms and Abbreviations Used in This Report

Acronym	Meaning
BNSF	Burlington Northern Santa Fe Railway
CFR	Code of Federal Regulations
EFH	essential fish habitat
ESA	Endangered Species Act
FEIS	final environmental impact statement
FHWA	Federal Highway Administration
GMA	Growth Management Act
HRM	(WSDOT) Highway Runoff Manual
HOV	high-occupancy vehicles
NEPA	National Environmental Policy Act
NOAA Fisheries	National Marine Fisheries Service
PFMC	Pacific Fisheries Management Council
ROD	Record of Decision
SEPA	State Environmental Policy Act
SPCC	spill prevention control and countermeasure plan
SPUI	single-point urban interchange
SR	State Route
TESC	temporary erosion and sedimentation control plan
UGA	Urban Growth Area
WSDOT	Washington State Department of Transportation

Glossary

Word	Meaning
Anadromous	Species that return seasonally to freshwater as subadults, sometimes for several years, before spawning
Escapement	The number of adult fish that enter a fresh water system to spawn.
Grubbing	Removal of vegetation, root balls and wads.
Mixed origin	A group of fish with differences in genetic history or makeup and are from a different basin, watershed, or hatchery.
Outplanting	Supplementation of natural fish populations with hatchery fish.
Pelagic	Above the seabed or riverbed. The pelagic zone is the deep open ocean environment.
Tightline	To place into or construct a pipeline.

1.0 Introduction

The Interstate 405 (I-405) Corridor Program Final Environmental Impact Statement (FEIS) provided a corridor-wide environmental review and Record of Decision (ROD) for improvements to I-405. The Selected Alternative identified in the ROD provides for widening I-405 by up to two lanes in each direction throughout its 30-mile length. The freeway design includes a buffer separating the general-purpose lanes and the high-occupancy vehicle (HOV) lane and it allows for future consideration of expanded managed lane operations along I-405.

The project is one of several projects advanced as part of a phased implementation of the Selected Alternative. In keeping with the direction established in the EIS and ROD, the project is proposed for evaluation within a National Environmental Protection Act (NEPA) Environmental Assessment (EA) that focuses on project-level effects of the improvements. The description and analysis of the project is based on a "Footprint-Complete" level of design.

This Biological Assessment (BA) analyzes the effects of the project (I-405 from SR 520, north to SR 522) on Endangered Species Act (ESA) listed species that may occur in the project vicinity, namely chinook salmon (*Oncorhynchus tshawytscha*), bald eagle (*Haliaeetus leucocephalus*) and bull trout (*Salvelinus confluentus*). Marbled murrelet (*Brachyramphus marmoratus*), a threatened species, and fisher (*Martes pennanti*), a candidate species, were not evaluated because they do not occur in the action area.

1.1 Background

The Washington State Department of Transportation (WSDOT) has joined with the Federal Highway Administration (FHWA), Federal Transit Administration (FTA), Central Puget Sound Regional Transit Authority (Sound Transit), King County, and local governments to develop strategies to reduce traffic congestion and improve mobility in the I-405 Corridor from Tukwila in the south to Lynnwood in the north (see Figure 1). Interstate 405 is the region's dominant north-south travel corridor east of Interstate 5 (I-5) and it is the designated military route because I-5 is deemed too constricted. At present, I-405 varies from six to ten lanes along the 30 mile corridor.

2.0 Project Description

The ESA review for the project incorporates, by reference, the I-405 Corridor Program FEIS and the Land Use Analysis for the corridor and analyzes the project-specific effects on the environment not considered in the corridor-level EIS. The project area extends approximately eight miles from the north side of the I-405/SR 520 interchange north to the south side of the I-405/SR 522 interchange (see Figure 2). The project will be constructed in two stages with Stage 1 beginning construction in mid-2005 and completion of Stage 2 by 2011. Principal features of the project are:

- Roadway construction to add a northbound general purpose lane from the I-405/NE 70th Street interchange to the I-405/NE 124th Street interchange
- Roadway construction to add a southbound general purpose lane from the I-405/SR 522 interchange to the I-405/SR 520 interchange
- Reconstruction, realignment, and reconfiguration of the I-405/NE 116th Street interchange
- Changes to local roadways, as necessary, for interchange improvements
- Stormwater management to provide water quality treatment and detention and conveyance system upgrades
- Context Sensitive Design which addresses aesthetic issues

2.1 Roadway Improvements

The major thrust of the project is to increase highway capacity by adding general-purpose lanes (as noted below) to I-405 and making operational improvements at a number of locations.

2.1.1 Main Line

One way to visualize the changes to the main line is to think of driving along I-405, beginning in Bellevue and moving northbound toward Bothell, returning to Bellevue in the southbound lanes. The following description of roadway improvements follows this route identifying changes as part of the project (see Figures 3-9).

Northbound, North of SR 520 Interchange to NE 70th Street: No changes are will occur for this section of roadway. This segment will continue to employ three general-purpose lanes and one HOV lane.

Northbound, NE 70th Street to NE 85th Street: The project will add one additional general-purpose lane for a total of four general-purpose lanes, plus one additional HOV lane. The existing drop lane (exit only) from the NE 70th Street off-ramp will become a through lane. The existing bridges over NE 85th Street will remain unchanged. The additional lane will be accommodated over these bridges by re-striping, resulting in narrow lanes and shoulders. The pavement may be widened to the outside in selected areas to provide vehicle emergency refuge areas.

Northbound, NE 85th Street to NE 116th Street: WSDOT will add one general-purpose lane for a total of four general-purpose lanes and one HOV lane. The existing pavement will be widened by 10 to 15 feet to the outside beginning at the on-ramp from NE 85th Street. (For improvements to the 116th interchange, see Interchanges below.) The existing noise wall just north of the on-ramp from 85th will be removed and replaced just inside the WSDOT right-of-way (ROW) limits to accommodate the new lane and shoulder.

Northbound, NE 116th Street to NE 124th Street: WSDOT will continue the new general purpose lane added from the south for a total of four general purpose lanes and one HOV lane when construction is completed. The existing pavement will be widened by up to 10 feet to the outside for the new lane. The new general-purpose lane will become a drop lane (exit only) at NE 124th Street.

Northbound, NE 124th Street to SR 522: North of the NE 124th Street off-ramp, WSDOT does not propose any changes to the roadway; it will remain as three general purpose lanes and one HOV lane for the immediate future.

Southbound, SR 522 to NE 160th Street: WSDOT will add one additional general-purpose lane in this area for a total of four general-purpose lanes and one HOV lane. The additional lane will connect to the existing merge lane from the eastbound SR 522 connector (to southbound I-405). The existing pavement will be widened up to 15 feet to the outside to accommodate the new lane.

Southbound, NE 160th Street to NE 124th Street: WSDOT will add one new general-purpose lane in this area so that there will be four general-purpose lanes and one HOV lane when the project is completed. The existing pavement will be widened by 10 to 15 feet to the outside from 160th southward for approximately 5,500 feet where the widening shifts to the inside of the roadway. WSDOT will re-stripe the widened pavement in the Sound Transit NE 128th Street Direct HOV Access Project. The on-ramp from NE 160th Street, including the existing noise wall on top of the barrier along the roadway shoulder, will be reconstructed to accommodate the additional southbound lane.

Southbound, NE 124th Street to NE 116th Street: Similar to the area to the north, WSDOT will add one additional general purpose lane in this area for a total of four general purpose lanes and one HOV lane.

Southbound, NE 116th Street to NE 85th Street: WSDOT will add one additional general-purpose lane in this area for a total of four general-purpose lanes and one HOV lane. The existing pavement will be widened by 10 to 15 feet on the outside edge of the roadway. The existing bridges over NE 85th Street will remain unchanged. The additional lane will be accommodated over these bridges by re-striping, resulting in narrower lanes and shoulders.

Southbound, NE 85th Street to NE 70th Street: WSDOT will add one additional general-purpose lane in this area so that there will be four general-purpose lanes and one HOV lane. The existing pavement will be widened by 10 to 15 feet on the outside edge of the roadway. The existing noise wall on top of barrier along the roadway shoulder between the pedestrian bridge (south of NE 85th Street) and the off-ramp to NE 70th Street will remain in place with a nonstandard (narrower) shoulder width.

Southbound, NE 70th Street to SR 520: WSDOT will add one additional general-purpose lane in this area so for a total of four general-purpose lanes and one HOV lane. The existing pavement will be widened by 10 to 15 feet on the outside edge of the roadway. The new lane will tie into the existing add lane for the connection to the SR 520 interchange. The existing noise wall on top of barrier along the roadway shoulder at the end of the NE 70th Street to on-ramp will be removed and relocated within the existing state right-of-way to accommodate the additional lane and shoulder.

Approximately 8 miles of new highway will be constructed for this project. This results in the construction of approximately 15 acres of new impervious surface.

2.1.2 Interchanges

NE 116th Street Interchange: The I-405/NE 116th Street interchange, which presently has a half-diamond configuration, will be reconstructed as a half single point urban interchange (SPUI) which is a design configuration that provides through and left turn control from a single traffic signal and free right turns to and from on- and off-ramps to allow for greater operational efficiency. In redesigning the interchange, the requirements for the Implementation Phase Plan were taken into consideration so that any future addition of lanes will only need minor modifications to on- and off-ramps. Elements of the interchange improvements (see Figure 6) will include:

- Reconstruction (phased removal and replacement) of the northbound and southbound I-405 bridges over NE 116th Street. The bridges will be built to accommodate the new northbound and southbound lanes and will provide greater vertical clearance over NE 116th Street
- Reconstruction of the northbound off-ramp and southbound on-ramp in the new half-SPUI configuration. As noted previously, this work will be compatible with future construction of the Implementation Plan ramps. No additional ramp work will be necessary for the Implementation Plan project with the exception of ramp tie-ins
- Widening of NE 116th Street on both sides of the interchange to accommodate dual-turn entrance and exit ramps. West side of the interchange, the widening (on both sides of the street) will extend for approximately 1,700 feet tapering from approximately 58 feet at the interchange to 43 feet at the west end. East of the interchange, both sides of NE 116th Street will be widened for approximately 900 feet. The curb-to-curb width will be approximately 70 feet from the interchange to the intersection at 124th Avenue NE
- Reconstruction of the NE 116th St bridge over the BNSF railroad tracks to widen the existing bridge by 31 feet.
- .Reconstruction of the 120th Avenue NE/NE 116th Street intersection to accommodate an additional eastbound through lane on NE 116th Street and improve turning radii at corners.

2.1.3 Local Roads and BNSF Tracks

Some local roads will be widened to accommodate the interchange reconfiguration. The improvements, described as part of the NE 116th Street interchange improvements, include widening of NE 116th Street, adding a right-turn lane on 120th Avenue NE at its intersection with NE 116th Street, and reconstruction of the NE 116th Street Bridge over the BNSF railroad tracks (see Figure 6).

2.1.4 Retaining Walls

In general, the widening of I-405 for the project will require retaining walls along portions of the northbound NE 116th Street off-ramp and the NE 116th Street on-ramp. New retaining walls will also be necessary along NE 116th Street to accommodate street widening (see Figure 6).

The following types of retaining walls will be constructed on the project: Mechanically Stabilized Earth (MSE), Cast in Place (CIP) and possibly soldier pile for retaining walls. The standard WSDOT noise wall is constructed with a small spread footing over cast-in-drilled hole (CIDH) piles.

2.1.5 Culverts

A new culvert providing fish passage under I-405 and carrying normal stream flows will be constructed at Forbes Creek while the existing culvert (or similarly sized replacement) will be utilized to pass stream high-flows. The culvert design will comply with the standard fish passage guidelines administered by the Washington Department of Fish and Wildlife (WDFW) and referenced in the 2002 MOA between WSDOT and WDFW.

2.1.6 Clearing and Grading Quantities

Approximately 47 acres of clearing and grading will be required for the additional lanes. Project earthwork will require approximately 165,000 cubic yards of cut and 105,000 cubic yards of fill. Clearing activities will impact less than 3.0 acres of Type III wetlands. The impacts are likely to result in a complete loss of wetland functions, which will result in a need for compensatory action.

2.1.7 Construction Methods, Duration and Staging

Construction will take place in over six years, beginning in 2005 and ending in 2011. The at-grade construction work will include the removal of existing asphalt /concrete surfaces, clearing and grading adjacent areas, laying the aggregate roadway foundation, and placing asphalt/concrete surfaces. Construction equipment such as backhoes, excavators, front loaders, pavement grinders, jackhammers, trucks, as well as grading and paving equipment will be used.

For the project only one overpass will be modified. The 116th Street interchange will be widened. No over or in-water work will be required for this overpass. For this overpass, the structures (including the over crossings) will be supported by underground drilled shafts or piles. In general, drilled shafts are built by drilling soils to the desired circumference and depth, pumping a sealing slurry or water into the hole as drilling proceeds to maintain the stability of the hole, installing rebar, and filling the hole with the concrete that forms the new drilled shaft. Once the required number of piles is in place, a footing will be built to connect the piles together to form the aerial structure foundation. Footings are built by excavating soils, placing a concrete form, installing rebar, and filling the form with concrete. After the foundation of the aerial structure is built, construction of the aboveground columns and girders proceeds. The columns and girders are typically cast-in-place type using concrete forms. Construction equipment used for aerial structures includes cranes, pile drivers, drilling rigs and augers, backhoes and excavators, jackhammers, concrete pumping equipment, and slurry processing equipment.

Construction impacts will be minimized through the use of best management practices and performance standards. These minimization methods are discussed in Chapter 7. A conceptual staging plan has been developed to illustrate how construction can occur with minimal disruptions to existing traffic patterns and capacity on the I-405 main line, the interchanges, and the local roadways. The main objectives of this plan are to maintain existing traffic capacity and to streamline the construction schedule.

Detour agreements with the local agencies may be obtained prior to contract award. A traffic control plan will need to be approved by WSDOT prior to construction. The contractor will also need to prepare and obtain approval of temporary erosion and sedimentation control (TESC) plan and a spill prevention control and countermeasure (SPCC) plan.

Staging areas in unused right-of-way will provide room for employee parking, large equipment storage, and material stockpiles. Construction staging will occur within areas of existing or newly acquired right-of-way adjacent to the main line; however, this does not mean that staging will not occur elsewhere. They will not be allowed in sensitive areas as defined by King County ordinances. The contractor has the option, and likely will find, other locations for storage/staging. Anticipated staging areas include the following:

- Along the project limits, there is generally adequate right-of-way to perform the work with typical machinery, including room for onsite staging.
- Infield areas of the southbound NE 70th Street on- and off-ramps
- Infield area of the northwest quadrant of the 85th loop ramp
- Triangular areas between the loop and stem ramp at the northwest, northeast, and southwest quadrants of the NE 85th Street interchange
- Infield area of the southbound NE 116th Street on-ramp
- Northbound and southbound along the main line, between NE 116th Street and the BNSF bridges, extra-wide WSDOT right-of-way exists. The northbound side has a wetland area near NE 116th Street and, therefore, will not be used; however, the remaining workable area is greater than 1.5 acres.
- Infield areas of the northeast, southeast, and southwest quadrants of the NE 124th Street interchange
- Infield areas of the northwest, northeast, southwest, and southeast quadrants of the NE 160th Street interchange (Figures 8 and 9).

2.2 Stormwater Management

The stormwater management facilities for the project have been designed to comply with the following guidelines and procedures:

- Washington State Department of Ecology (Ecology) Stormwater Management Manual for Western Washington, Volumes I – V, August 2001
- WSDOT Highway Runoff Manual M 31-16, March 2004
- WSDOT Hydraulics Manual M 23-03, January 1997

These documents require water quality treatment for 100 percent of new impervious surfaces and detention of the 2-year through 50-year storm events. Additional design references and guidelines were used as they apply for local jurisdictional requirements, particularly those guidelines established by the King County Surface Water Design Manual (1998). It should be noted that for the purposes of design and sizing of treatment and detention facilities, the baseline condition was assumed to be forested conditions rather than existing conditions. This leads to more conservative design flows resulting in larger treatment and detention facilities.

3.0 Description of Action Area

An action area, as defined in 50 Code of Federal Regulations (CFR 17.11), is not merely the immediate footprint of the project, but all areas directly or indirectly affected by federal action. As a result, the action area is larger than the project area. This includes the geographic extent of impacts, such as equipment staging areas, water bodies receiving stormwater, and wetland or other mitigation sites resulting from project impacts as well as, interrelated and interdependent consequences, such as direct and indirect chemical, physical, or biological direct and indirect effects. Similarly, the extent of noise impacts associated with the project extend to a one-mile radius (WSDOT, 2002).

Because the project may potentially affect both listed salmonid species, the action area includes downstream and surrounding physical, biological, and chemical effects to natural resources such as wetlands, creeks, streams, riparian areas, salmonid habitat, as well as receiving water bodies and upstream fish passage barriers.

Noise and other disturbances during the construction phase of the action may disrupt eagle habitat, as well as perching, foraging and nesting grounds. In addition, the analysis in this Biological Assessment assumes that the arterial improvements described in the Final EIS are constructed.

To adequately assess the potential effects on listed endangered salmonid and eagle species, representatives of WSDOT, endangered species resource agency biologists and the I-405 project team concluded that the boundaries of the project action area would be defined as follows:

The eastern edge parallels the project alignment one mile east of the I-405 Corridor and extends to the headwaters of Yarrow, Forbes and Juanita Creeks, includes the Sammamish River and encompasses the I-405 interchange with SR 520 north to SR 522.

The western edge extends from the I-405 Corridor west to the stream outlets into Lake Washington and includes all of the area west of I-405 to Lake Washington.

The northern edge is located one mile north of the mitigation site located on North Creek (at approximately RM 4.0) The action area thus will extend from the Sammamish River to one mile north of the mitigation site approximately ½ mile south of the SR520/I-405 interchange.

The southern edge is located approximately ½ mile south of the SR 520/I-405 interchange (Figure 2).

4.0 Environmental Baseline

As noted above, this I-405 project extends from SR 520 on the south to SR 522 on the north. This portion of the action area is heavily urban, with few trees, having narrow wetlands outside the project boundaries and grassy areas adjacent to the paved shoulders.

Beyond the noise barrier walls, the surrounding area is comprised of commercial and residential development, schools, parks, and open space. Project biologists surveyed the following water resources to assess their viability for sustaining salmonid resources:

4.1 North Creek

Chinook (ESA Threatened), as well as coho (ESA Species of Concern), sockeye, kokanee salmon, and steelhead use North Creek, which extends north from its confluence with the Sammamish River approximately ½ mile downstream of the SR 522 interchange (King County 2001). However, intensive urbanization in the watershed has degraded its salmonid habitat. Impervious surfaces now cover about 49 percent of the project area portion of the basin (King County 1999). This development has altered basin hydrology to the extent that the current 2-year flood discharge is now estimated to exceed the historical 100-year flood discharge (King County 2001). These altered watershed conditions have led to excessive channel scouring and widening, erosion, reduction in pool habitat, and degradation of the benthic macroinvertebrate community.

In addition, because watershed development has triggered exaggerated high peak and low base flows, many stream reaches dry up in the summer. Channel scouring has motivated property owners to armor much of the streambank exacerbating the effects of unnatural conditions. Clearing of riparian vegetation has removed large woody debris, resulting in a lack of instream complexity that forms the basic structure of fish habitat formation. These changes limit all life stages of the salmonid species by reducing spawning and rearing habitat (King County 2001).

Kerwin (2001) notes that up to 22 chinook were observed in 1999 and 5 in 2000. Habitat conditions include lack of pools, temperatures in excess of 16ºC, heavy sedimentation and loss of forage species. Chinook are migrating into the lower creek and spawning; water quality conditions limit rearing habitat.

North Creek shows evidence of several chronic water quality problems likely to limit salmonid survival. Water temperature monitoring found numerous water temperature spikes above 16ºC, which is likely to limit successful salmonid rearing. In addition, dissolved oxygen has often fallen below state standards in the past and levels of fecal coliform, lead, copper, and zinc have exceeded state standards (King County 2001).

4.2 Sammamish River

Coho (ESA Species of Concern), sockeye, kokanee, and Chinook (ESA Threatened) salmon, as well as steelhead, sea-run cutthroat, resident trout, and non-salmonids use the mainstem Sammamish River for migration and rearing for in and out migration from/to tributaries upstream of the project area (King County, 2001). The mainstem Sammamish River is underlain almost entirely by a silt substrate that limits spawning habitat. Sparse large woody debris and a nearly complete absence of pools further limit suitable rearing habitat (King County, 2001). During channel reconstruction, much of the riparian vegetation was removed within the action area and most of the side channel habitat cut off (King County, 2001). Therefore, salmonid use is primarily as a migration corridor to better habitats upstream (i.e., Bear Creek basin).

Impervious surface now covers about 37 percent of the basin (WSDOT, 2001). This urbanization has brought about higher peak flows and lower base flows than would be expected under natural conditions. Stressful, even lethal water temperatures to salmon (over 25ºC) have been documented, and dissolved oxygen levels have fallen below the optimum range for salmonids (King County, 2001).

4.3 Juanita Creek

The mainstem of Juanita Creek, with headwaters east of I-405 flowing from Totem Lake, flows to the west and south prior to entering the northeast end of Lake Washington on the western side of Juanita Beach Park (see Figure 10). The Juanita Creek basin encompasses approximately 6.6 square miles (17.14 km^2), 45 percent of which is impervious (WSDOT, 2001). Intensive urbanization in this watershed has severely degraded salmonid habitat, with parts of the stream channelized within armored banks through urban areas. (May,1996). However, several large wetlands remain in the upper portion of the watershed.

Juanita Creek has three primary tributaries, which in turn receive flows from at least eleven smaller tributaries. Fish passage barriers, including weirs, velocity barriers, long underground culverts, and gradient barriers are present on several of the tributaries throughout the system (Kerwin, 2001). Three perennial Juanita Creek tributaries pass under I-405 in culverts, as discussed below (see The Watershed Company 1998 report for stream references).

Kerwin (2001) citing several sources (The Watershed Company 1998; Williams 1975; May et al 1997) indicating that Juanita Creek, although used by other salmonids, is not used by Chinook. Migration and rearing habitat is not available for chinook.

Totem Lake Tributary #235 has three distinct sections, of which only the lowermost may contain or listed salmon. This section extends from a culvert outfall at 102nd Avenue NE. During electrofishing surveys between February 19 and March 17th, no chinook salmon were captured. The stream channel contains gravel substrate suitable for salmonid spawning, with some shallow pools and woody debris (The Watershed Company, 1998).

Tributary #238 is comprised of several small, and some likely ephemeral, tributaries. The lower part of the tributary flows through a well-wooded ravine to the east and upstream of 108th Avenue NE. The stream flows through areas of multi-family housing and health care facilities upstream of I-405. The culvert under 120th Ave NE has a plunge at the outfall that presents a barrier to upstream fish movements. Downstream, channels are braided and stream banks are down cut and/or eroded in many areas. During test electrofishing conducted on the east side of I-405 near Totem Lake Boulevard, no fish were captured (The Watershed Company, 1998).

Tributary #241 is an unnamed upper tributary to Juanita Creek flowing under I-405 near the terminus of NE 145th Street. In 2004, estimates of its winter flow contribution ranged from 2 to 4 cubic feet per second (cfs). The stream channel meanders behind residential neighborhoods (north of NE 140th Street), before its confluence with Tributary # 230. The stream is classified as Tributary #230 thereafter.

Sockeye and coho salmon, as well as steelhead, use this tributary (Williams et al., 1975). The stream is also inhabited by coastal cutthroat trout including sea-run cutthroat trout, as evidenced by electrofishing surveys (Watershed Company, 1998). Other than sockeye, Ludwa et al., (1997) found similar results during electrofishing surveys in 1996. A survey conducted in 1997, (Ludwa et al.) found no sockeye, but the highest densities of coho were found at the sites farthest upstream at RM 2.1 on Tributary #230, above Edith Moulton Park. No chinook were captured.

4.4 Forbes Creek

The 2.1-mile-long Forbes Creek drains about 2,322 acres immediately east of Lake Washington (see Figure 10). The primary flow for Forbes Creek, which originates in Forbes Lake, meanders through a residential neighborhood and a series of small wetlands, and before flowing through a culvert under I-405 at approximately River Mile 1.5.

Forbes Creek has a remnant north fork but most natural functions in this section of the creek are absent. With the exception of a few vestiges of open channels adjacent to I-405 northbound, a pipe completely constricts its flow until it joins the main fork of Forbes Creek.

Three minor tributaries discharge into Forbes Creek downstream of Forbes Lake. These tributaries' sources appear to originate from the same series of wetlands referenced above which may represent the original Forbes Creek channel between Forbes Lake and lower Forbes Creek. Natural riparian and stream buffers flourish throughout the drainage above and below Forbes Lake.

Downstream of I-405, the mainstem of Forbes Creek is piped under a parking lot adjacent to a stormwater treatment facility and resurfaces before its confluence with the north fork flows.

A series of lakeshore wetlands provide a quality natural wetland and riparian habitat for the lower 4,000 feet of Forbes Creek. The City of Kirkland manages a natural lakeshore park within Juanita Bay where Forbes Creek flows through the wetlands and into Lake Washington. Beaver populations are very active near the mouth of the stream, which creates pools and several side channels.

Salmonid habitat has been degraded by intensive development in this watershed. The basin downstream of I-405 has extensive wetland and open space. However, there are 2 migrations barriers downstream of I-405. Below the barriers, Forbes Creek lacks the pool habitat necessary for rearing of chinook juveniles

During surveys of Forbes Creek, no chinook were captured (The Watershed Company 1998). Coho salmon and coastal cutthroat trout, possibly steelhead (Ludwa et. al. 1997), and sockeye use Forbes Creek. Researchers also found resident or juvenile steelhead trout measuring less than 80 mm in Forbes Creek immediately below I-405. Trout populations may also spawn in Forbes Lake and in the upper basin and contribute to downstream recruitment below I-405. Non-salmonid species found during sampling efforts include stickleback, lamprey, and dace. In 2002, King County aquatic surveyors found sockeye for the first time during in lower Forbes Creek at RM 0.2. The upstream migration of these fish is limited by the underground piped section referenced above, (Watershed Company, 1998), which is approximately 1,000 feet downstream of I-405.

Intensive development in this watershed, evidenced by approximately 43 percent impervious surface, has degraded salmonid habitat. Industrial parks, residential development, and small remnants of rural residential land use primarily occupy this heavily urbanized basin (WSDOT, 2001). Many reaches of Forbes Creek upstream of the lake, as well as most reaches of Forbes' tributaries, have been tight-lined though pipes eliminating all habitat.

4.5 Yarrow Creek

Although Yarrow Creek does not cross under I-405 within the project corridor, it does flow parallel to the interstate and is therefore included in the action area (see Figure 10). The Yarrow Creek corridor passes under and parallel to roads and railroads for most of its length including SR 520 and I-405. Yarrow Creek flows from Bridle Trails State Park, which is adjacent to the project road segment, parallels I-405, turns west near the I-405/SR 520 interchange and enters Lake Washington through the Yarrow Bay wetlands.

No listed species have been identified in Yarrow Creek (The Watershed Company 1998). Cutthroat trout use Yarrow Creek throughout its length. Coho salmon have access and may use the lower reaches of the stream. However, the culvert under NE Points Drive at River Mile 0.2 blocks migratory fish passage in Yarrow Creek from the Yarrow Bay wetlands (Menconi and Johnson, 1998). Additional barriers to upstream migration of fish occur at one or more locations farther up the creek, most notably at the railroad grade just downstream of I-405 (The Watershed Company, 1998).

Specifically, just upstream of Northup Way (west and downstream of I-405), a combination of culverts under a business parking lot, the railroad right-of-way, and I-405 form a definitive barrier to the upstream migration of salmon and trout (The Watershed Company, 1998). East and upstream of I-405 Yarrow Creek flows through a narrow, albeit forested, corridor. Fish in the upper reaches, above the railroad grade, are members of isolated populations due to the presence of upstream migration barriers. Therefore, upstream of I-405, salmonid use in Yarrow Creek is not likely. However, coho salmon could utilize the corridor south of I-405, although not extensively due to habitat restrictions in the area.

4.6 Cochran Creek

Cochran Creek, considered a less developed tributary to Yarrow Creek, also drains into the Yarrow Bay wetlands (see Figure 10). The headwaters originate west of I-405 and although this creek is isolated from the I-405 Corridor, it is located within the action area as defined for this project (one mile east and west of the interstate to Lake Washington). The main source of flow for the creek is steady, spring-fed waters of good quality.

No listed species have been identified in Cochran Creek (The Watershed Company 1998). Cutthroat trout and coho salmon use the lower reaches of the creek upstream of the Yarrow Bay wetlands. Lamprey were also captured during electrofishing. A number of migration barriers are located farther up within the watershed, precluding upstream migration (The Watershed Company, 1998).

4.7 Carillon Creek

The small Carillon Creek basin enters Lake Washington at Carillon Point (see Figure 10). Springs in the headwaters of the creek are located approximately 0.5 miles west of I-405 and provide steady, high-quality flows. The wetted perimeter averages less than 5 feet. The entire creek is isolated from I-405.

Within the lower section of Carillon Creek, sandy sediment dominates the substrate. During a 1998 survey, sediment loading and deposition appeared to be causing a braided channel section and an instream pond to be increasingly filled just downstream of Lake Washington Boulevard (The Watershed Company, 1998).

No listed species have been identified in Carillon Creek (The Watershed Company 1998). Fish use of the lower section of Carillon Creek probably includes both cutthroat trout and coho salmon, since both species have direct access from Lake Washington. Coho fry are planted annually and at least a few returning adults have been seen (The Watershed Company, 1998). An excessive (2-foot) drop with a shallow plunge pool exists in the first section of stream immediately upstream from Lake Washington, creating a migration barrier for upstream movement, especially for juvenile salmonids.

4.8 Moss Bay Creek

This creek and its associated tributaries are located perpendicular to I-405. The main channel appears to have moderate flow; estimated by project biologists to be approximately 5 cfs (The Watershed Company 1998). Although no obvious surface flows or stream channels flow east of I-405, the origin of the creek is likely in the immediate vicinity of I-405, either as a spring piped east or west of I-405. The City of Kirkland Surface Water maps show Moss Bay Creek as intermittent between Everest Park and Lake Washington.

Between February 19th and March 17th, electrofishing surveyors captured no salmonid fish in Moss Bay Creek, downstream of Everest Creek. A small section of the creek downstream of I-405 could potentially serve as habitat for cutthroat trout, however this section is very limited and low or no summer flows could preclude use by cutthroat (The Watershed Company, 1998).

4.9 Urban Drainages

Four small stream basins originate west of I-405 and flow to Lake Washington (see Figure 10). A unifying characteristic of all these streams is that they flow through systems of pipes for considerable portions of their downstream lengths and enter Lake Washington at the outfalls of those pipes. No anadromous or resident salmonid fish inhabited any of them (The Watershed Company, 1998).

5.0 Species and Critical Habitat That May be Affected

5.1 Puget Sound Chinook Salmon

5.1.1 Habitat Requirements/Population Status

On March 29, 1999, the National Marine Fisheries Service (now referred to as NOAA Fisheries) listed Puget Sound chinook salmon (*Oncorhynchus tshawytscha*) as a threatened species (64 FR 14308; March 24, 1999). In 2000, NMFS adopted a rule designating critical habitat for Puget Sound chinook salmon. However, an April 2002 federal court decision ruling rescinded the initial February 2000 critical habitat designation for this and 18 other ESUs. Thus, at this time, no critical habitat is designated for Puget Sound chinook salmon.

Three populations of chinook stock are within the Lake Washington Basin (Water Resource Inventory [WRIA] 8): North Lake Washington tributaries chinook, Issaquah chinook, and Cedar River chinook stock. Only habitat for the North Lake Washington and Issaquah chinook stocks occur within the action area for this assessment. Therefore, the following discussion will be limited to those stocks.

The North Lake Washington chinook stock is mixed with composite production (WDFW, 2004). In the 1992 Salmon and Steelhead Stock Inventory (SASSI), the status of this stock was unknown (WDFW, 1994). However, in 2002 it rated this stock as healthy due to sufficient escapement levels (WDFW, 2004). As shown in Figure 12, this population spawns in the following creeks: North, Swamp, Bear, Little Bear, Thornton, McAleer, and Cottage Lake, as well as within the Sammamish River, which is included in the project action area (WDFW, 2004).

The Issaquah chinook stock originated in the Green River (WRIA 9) with composite hatchery production. The 1992 SASSI rated this stock as healthy. Since the number of naturally spawning chinook has been high and stable, the status remained healthy in 2002 (WDFW, 2004). Most spawning within this stock takes place in Issaquah Creek and its East Fork from late September through October. Although the spawning habitat is outside of the project action area, upstream and downstream migrants use the Sammamish River or other tributaries within the action area as a migratory corridor and juveniles may rear in the vicinity of the action (see Figure 13).

5.1.2 General Distribution and Life History

Chinook salmon follow a generalized life history, which includes the incubation and hatching of embryos; emergence and initial rearing of juveniles in fresh water; migration to oceanic habitats for extended periods of feeding and growth; and return to natal waters for completion of maturation, spawning, and death. Within this general life-history strategy, however, chinook salmon display diverse and complex life history patterns and tactics. Research biologists have documented at least 16 age categories of mature chinook salmon involving three possible fresh water ages and ages of 2-to-8-year-old fish, reflecting the high variability within and among populations in fresh water, estuarine, and oceanic residency (Healey, 1986).

This variation in life history can be partially explained by separating chinook salmon into two distinct races: ocean-type and stream-type (Healey, 1983, 1991). Stream-type fish have long freshwater residence as juveniles (1 to 2 years) migrate rapidly to oceanic habitats, and adults often enter fresh water in spring and summer, spawning far upriver in late summer or early fall. Ocean-type fish have short, highly variable freshwater residency (from a few days to several months), extensive estuarine residency, and adults show considerable geographic variation in month of freshwater entry.

Most Puget Sound chinook salmon are ocean-type (63 FR 11481; March 9, 1998), or chinook, although drainages can support multiple, biologically separate runs due to temporal and spatial separation of spawning. Some Puget Sound chinook salmon are stream-type fish, typically referred to as spring or summer chinook. In Puget Sound, a portion of the stream-type fish remains in Puget Sound. These Puget Sound resident populations, commonly referred to as blackmouth, are primarily natural spring- and summer-run fish of mixed origin. Although the largest blackmouth component is thought to be primarily hatchery chinook stocks, native chinook also remain resident in Puget Sound. Thus, some portion of the resident blackmouth will be naturally spawned chinook included under the threatened listing.

The distinction between Healey's (1983 and 1991) description of stream-type chinook versus management agencies' stream-type chinook is the inclusion of blackmouth chinook. Spring and summer chinook are managed and regulated as a separate stock, while blackmouth chinook are not. Most of the Lake Washington tributaries produce fall chinook, rather than spring or summer chinook. For purposes of this report, fall chinook are considered as ocean-type chinook while the spring and summer chinook are considered to be stream-type fish.

Chinook salmon spawning time varies depending primarily upon the geographic location and the specific race or population. Within the Lake Washington Basin, chinook generally spawn from mid-September through October in a broad range of habitats (WDFW and WWTIT, 1994). They spawn in water depths ranging from a few centimeters to several meters deep, and in small tributaries 2 to 3 meters wide to large rivers such as the Columbia River. All chinook salmon require cold, freshwater streams with suitable gravel for reproduction. Because of their large size, chinook salmon are able to spawn in higher water velocities and to utilize coarser substrates than other salmon species. Females deposit their eggs in redds that they excavate from 10 to 80 cm in depth in the gravel bottom in areas of relatively swift water (Healey, 1991). Eggs hatch in approximately 6 to 12 weeks, and newly emerged larvae remain in the gravel for another 2 to 4 weeks until the yolk is absorbed (Moyle 1976; Beauchamp et al., (1983); Allen and Hassler, 1986). For maximum survival of incubating eggs and larvae, water temperature must be between 41°F and 57°F.

After emerging, chinook salmon fry tend to seek shallow, nearshore habitat with low water velocities, and move to progressively deeper, faster water as they grow. Juveniles rear in fresh water for up to several months before migrating to sea. Typical outmigration for juvenile chinook extends from January to August (Kerwin 2001). Chinook salmon typically spend 2 to 4 years maturing in the ocean before returning to their natal streams to spawn. Adult chinook enter Lake Washington from mid-August through late October. All adult chinook salmon die after spawning (Moyle, 1976; Beauchamp et al., (1983); Allen and Hassler, 1986).

5.1.3 Known Occurrences in Project Vicinity

Chinook salmon use within the action area streams appears to be nonexistent or very limited (see Figures 12 and13). Neither The Watershed Company (1998) nor Kerwin (2001) found chinook during surveys conducted for the City of Kirkland and during fish inventory surveys conducted between February 19 and March 17, respectively. Ludwa et al., (1997) did not find chinook during 1996 summer surveys in Juanita and Forbes Creek. The King County volunteer adult spawning surveys did not find chinook when sampling project segment streams in 2002 (King County 2002).

Juanita Creek

In 1997, Ludwa et al., (1997) sampled for juvenile chinook near River Mile 0.3 of Juanita Creek. Even though juvenile chinook (Ages 0+ and 1+) from other systems have year-round access to the stream habitat in Juanita Creek, chinook were not found.

However, chinook distribution maps prepared by King County (2001) indicated that chinook habitat occurs on Juanita Creek upstream as far as I-405. While the instream habitat is accessible (see coho discussion below), the observation of adults or juveniles in Juanita or Forbes Creek is difficult to confirm. Recent spawning surveys did not identify any chinook adults spawning in Juanita Creek (King County, 2002 and 2003).

As noted above, neither The Watershed Company (1998) nor Kerwin (2001) reported chinook salmon use of Juanita Creek. Ludwa et al., (1997) surveyed several of the Lake Washington tributaries during low flow periods during summer of 1996 including Juanita and Forbes Creek. No chinook were sampled in the project segment streams, or within any of the other Lake Washington tributaries. Further, Kerwin (2001) citing several sources (The Watershed Company 1998; Williams 1975; May et al 1997) indicating that Juanita Creek, although used by other salmonids, is not used by Chinook. Migration and rearing habitat is not available for chinook.

A variety of urban impacts on Juanita Creek contribute significantly to the following stream conditions that limit the presence of salmonids, especially chinook:

- May et al., (1997) found between 20 and 30 percent fines in Juanita Creek segments, among the highest in sampled Puget Sound lowland streams
- Road crossings/culverts, streambank armoring, channel incision and instability, and historical and ongoing clearing and development in riparian areas reduce the channel complexity, connectivity with the floodplain and adjacent stream reaches (May et al., 1997)
- The presence of large woody debris is scarce, averaging only 19.1 pieces/km (30.6 pieces per mile)
- Riparian buffers vary in width from less than 10 feet to a maximum of 50 feet. Only three segments of the stream contain at least 50-percent forested riparian area
- Water quality is very poor because pesticides, fecal coliform, and temperature levels all exceed Washington State water quality standards (Kerwin, 2001)

Forbes Creek

In recent years, research biologists conducted several adult and juvenile salmon surveys in Forbes Creek (The Watershed Company, 1998; Kerwin, 2001; Ludwa et al., (1997); King County, 2002 and 2003). No chinook were found in Forbes Creek. The barrier to upstream migration is a piped section under a parking lot above Forbes Creek Drive (The Watershed Company, 1998; WSDOT, 2001).

Yarrow Creek

Salmon survey data was not available for upper Yarrow Creek. Several complete fish passage barriers exist in the lower sections of Yarrow Creek.

North Creek

In 1999, one chinook redd was observed during stream habitat work near the mouth. In addition, in 1998 and 1999, volunteer salmon watchers observed 11 and 22 chinook, respectively (King County 2001). In 2000, five chinook were observed in North Creek (Kerwin 2001).

Table 5-1 presents the NOAA Fisheries matrix of pathways and indicators for chinook.

Table 5-1: Matrix of Diagnostics/pathways and Indicators for Chinook Salmon in Western Washington

Diagnostic/ Pathways: Indicators	Population and Environmental Baseline			Effects of the Action		
	Properly Functioning Criteria	Present condition	Functionality (PF/AR/NPF)	Restore	Maintain	Degrade
Water Quality: Temperature Avg Max Summer	40 to 57°F for spawning and incubation[1]	Forbes, Juanita, Yarrow Creeks; Lake Washington, Sammamish River on 303(d) for temp	AR		X	
Sediment	Less than 12% fines (fines = <6.4mm)	Portions of Lake Washington on 303(d) list for sediment[1]	PF/AR		X	
Chemical Contamination/Nutrients	Low levels of contamination, no 303(d) streams	Five water bodies on 303(d) list, but none for nutrients	AR		X	
Habitat Access: Physical Barriers	Less than one fish passage barrier	Culverts and piping of Forbes and Juanita Creeks may restrict at low flow; Yarrow Creek complete fish passage barriers	AR		X	
Habitat Elements: Substrate Embeddedness Percent clean substrate	Gravel, cobble dominant; embeddedness Greater than 20%	Excessive fines Juanita and upper Forbes Creeks greater than 20% embeddedness	AR		X	
Large Woody Debris (LWD)	10 to 20 pieces/100 linear feet[1]	Urbanization has resulted in loss of LWD; lacks potential for recruitment	AR		X	

Table 5-1: Matrix of Diagnostics/pathways and Indicators for Chinook Salmon in Western Washington

Diagnostics/ Pathways Indicators	Population and Environmental Baseline			Effect of the Action		
	Properly Functioning Criteria	Present condition	Functionality (P/AR/NPF)	Restore	Maintain	Degrade
Pool Frequency	Channel width #pools/mi 5 feet = 184 10 feet = 96 15 feet = 70 20 feet = 56 25 feet = 47 50 feet = 26 75 feet = 23	Scour function limited by lack of in-stream structure in Juanita Creek; limited pool frequency in upper and middle Forbes Creek	AR		X	
Pool Quality	3.28 feet or 1 meter deep with good cover	Streams lacking pools; average pool depth smaller than 3.28 feet or 1 meter	NPF		X	
Large Pools	Each reach has many large pools (3.28 feet or 1 meter deep)	Very few pools greater than 1 meter in depth	AR		X	
Off-channel Habitat	Many backwaters with cover	Backwaters present, but elevated in temperature	AR		X	
Refugia	Sufficient with adequate buffer and riparian	Riparian habitat disturbed in urbanized corridor	AR		X	
Channel Conditions and Dynamics: Avg. Wetted Width/Max. Depth Ratio	Ratio is 10	See Fish and Aquatic Resources Discipline Report	AR		X	
Streambank Condition	≥90% stable	<90% stable in all of Juanita Ck < 90% stable in upper and middle Forbes Ck	AR		X	

Table 5-1: Matrix of Diagnostics/pathways and Indicators for Chinook Salmon in Western Washington

Diagnostics/ Pathway: Indicators	Population and Environmental Baseline			Effects of the Action		
	Properly Functioning Criteria	Current condition	Functionality (P/AR/NPF)	Restore	Maintain	Degrade
Floodplain Connectivity	Frequent hydrologic connection to main channel	Culverts and piping reduce linkage to wetlands, riparian areas, and floodplains, except in lower Forbes Ck	AR/NPF		X	
Water Quality: Temperature Avg Max Summer	40 to 57°F for spawning and incubation[1]	Forbes, Juanita, Yarrow Creeks; Lake Washington, Sammamish River on 303(d) for temp	AR		X	
Sediment	Less than 12% fines (fines = <6.4mm)	Portions of Lake Washington on 303(d) list for sediment[1]	PF/AR		X	
Chemical Contamination/Nutrients	Low levels of contamination, no 303(d) streams	Five water bodies on 303(d) list, but none for nutrients	AR		X	
Habitat Access: Physical Barriers	Less than one fish passage barrier	Culverts and piping of Forbes and Juanita Creeks may restrict at low flow; Yarrow Creek complete fish passage barriers	AR		X	
Habitat Elements: Substrate Embeddedness Percent clean substrate	Gravel, cobble dominant; embeddedness Greater than 20%	Excessive fines Juanita and upper Forbes Creeks greater than 20% embeddedness	AR		X	
Large Woody Debris (LWD)	10 to 20 pieces/100 linear feet1	Urbanization has resulted in loss of LWD; lacks potential for recruitment	AR		X	

Table 5-1: Matrix of Diagnostics/pathways and Indicators for Chinook Salmon in Western Washington

Diagnostic/ Pathway/ Indicators	Population and Environmental Baseline			Effects of the Action		
	Properly Functioning Criteria	Current condition	Functionality (P/AR/NPF)	Restore	Maintain	Degrade
Pool Frequency	Channel width #pools/mi 5 feet = 184 10 feet = 96 15 feet = 70 20 feet = 56 25 feet = 47 50 feet = 26 75 feet = 23	Scour function limited by lack of in-stream structure in Juanita Creek; limited pool frequency in upper and middle Forbes Creek	AR		X	
Pool Quality	3.28 feet or 1 meter deep with good cover	Streams lacking pools; average pool depth smaller than 3.28 feet or 1 meter	NPF		X	
Large Pools	Each reach has many large pools (3.28 feet or 1 meter deep)	Very few pools greater than 1 meter in depth	AR		X	
Off-channel Habitat	Many backwaters with cover	Backwaters present, but elevated in temperature	AR		X	
Refugia	Sufficient with adequate buffer and riparian	Riparian habitat disturbed in urbanized corridor	AR		X	
Channel Conditions and Dynamics: Avg. Wetted Width/Max. Depth Ratio	Ratio is 10	See Fish and Aquatic Resources Discipline Report	AR		X	
Streambank Condition	>90% stable	<90% stable in all of Juanita Ck < 90% stable in upper and middle Forbes Ck	AR		X	
Floodplain Connectivity	Frequent hydrologic connection to main channel	Culverts and piping reduce linkage to wetlands, riparian areas, and floodplains, except in lower Forbes Ck	AR/NPF		X	

Table 5-1: Matrix of Diagnostics/pathways and Indicators for Chinook Salmon in Western Washington

Diagnostics/ Pathways: Indicators	Population and Environmental Baseline			Effects of the Action		
	Properly Functioning Criteria	Present condition	Functionality (P/AR/NPF)[1]	Restore	Maintain	Degrade
Flow/Hydrology: Disturbance History/ Change in Peak/Base Flows	Less than 15% Equivalent Clear-cut Area (ECA); base flow, peak, and flow timing comparable to undisturbed	Significant hydrologic restrictions from culverts/piping that alter peak and base flow in all streams	AR		X	
Increase in Drainage Network	Zero or minimum increase in drainage network	Significant increases in drainage network in all action area streams due to urbanization and development	NPF		X	
Watershed Conditions: Road Density and Location	<2mi/mi2; no valley bottom roads	>3mi/mi2; many valley bottom roads	NPF		X	
Riparian Reserves	Riparian corridor at least 80% intact; composed of 50% endemic vegetation	Riparian corridors disturbed in most areas, except in lower Forbes Creek	AR		X	

PR = Properly functioning, AR = At Risk, NPF = Not properly functioning F = functioning appropriately, FR = functioning at risk, FU = functioning at unacceptable risk

Lake Washington Basin (WRIA 8) tributaries within the action area (NMFS 1996; USFWS 1998)

[1]http://www.ecy.wa.gov/programs/wq/303d/2002/wria_pdfs/wria8.pdf

5.2 Bull Trout

5.2.1 Habitat Requirement/Population Status

In 1999, the USFWS listed the Coastal-Puget Sound population of bull trout (*Salvelinus confluentus*) as a threatened species (64 CFR 58910; November 1, 1999).

Bull trout occur in widespread, but fragmented habitats. The Coastal-Puget Sound bull trout population encompasses all Pacific Coast drainages within Washington, including Puget Sound. This population segment includes the only anadromous bull trout found in the coterminous United States. Because bull trout and Dolly Varden are virtually impossible to differentiate visually, the Washington Department of Fish and Wildlife manages the two species together as "native char." The Coastal-Puget Sound population segment contains 35 subpopulations of native char (Bowerman et al., (1998).

Bull trout exhibit resident and migratory life-history strategies throughout much of their current range (Reiman and McIntyre, 1993). Resident bull trout complete their life cycles in the tributary (or nearby) streams in which they spawn and rear. Migratory bull trout spawn in tributary streams where juvenile fish rear from one to four years before migrating to either a lake (adfluvial), river (fluvial) or in certain coastal areas, to saltwater (anadromous or amphidromouse) to mature (Fraley and Shepard, 1989; Goetz, 1989).

Bull trout have more specific habitat requirements compared to other salmonids. Habitat components (limiting factors) that appear to influence bull trout distribution and abundance include water temperature, cover, channel form and stability, valley form, spawning and rearing substrates, and migratory corridors (Oliver, 1979; Pratt, 1984, 1992; Fraley and Shepard, 1989; Goetz, 1989).

Watson and Hillman (1997) concluded that watersheds must have specific physical characteristics to provide habitat requirements for bull trout to successfully spawn and rear. Bull trout favor primarily colder streams, although individual fish are found in larger river systems (Fraley and Shepard, 1989; Rieman and McIntyre, 1993, 1995; Buchanan and Gregory, 1997). Water temperature above 15°C (59°F) is believed to limit bull trout distribution.

Bull trout are multi-year spawners and typically spawn from August to September during periods of decreasing water temperatures. Migratory bull trout frequently begin spawning migrations as early as April and have been known to move upstream as far as 250 km (155 miles) to spawning grounds. For successful spawning and egg incubation, bull trout require very cold water with spawning occurring in the fall of the year as the temperatures drop below 46°F and the successful incubation of the eggs requires temperatures below 40°F. In this region, the downstream limit of successful spawning is always upstream of the winter snow line (Kraemer, 1999). Bull trout require spawning substrate consisting of loose, clean gravel relatively free of fine sediments.

The newly emergent fry rear near their spawning areas. The growing juveniles can adopt one of the three life strategies discussed above. Some fry may drop downstream looking for foraging opportunities and, depending on the rearing habitats that they select, may enter the estuary. The foraging juvenile and sub-adult char may migrate throughout the basin looking for feeding opportunities. Because of this behavior they may be found anywhere in the basin downstream of spawning areas (Kraemer, 1999).

5.2.2 Known Occurrences in the Project Area

Information on the presence, abundance, distribution, use, and life history of bull trout in the Lake Washington basin is extremely limited. Bull trout populations are usually associated with stream habitat that is above the winter snow line. Individual fish utilize stream or lake habitat below these elevations, which serve as important migratory corridors or possibly feeding areas.

Although bull trout/Dolly Varden are known to inhabit the Lake Washington basin, including the Cedar River and Lake Sammamish subbasins, spawning has been documented only in locations far upstream of the action area (WDFW, 1998). Reports of bull trout or char from Lake Washington and within the project action area are rare (USFWS 2004, Foley 2004). For instance, during a two-year creek survey conducted in Lake Washington and its tributaries, only one char was observed (Pfeiffer and Bradbury, 1992). An angler in Lake Washington captured another native char, not specifically identified as bull trout, in 1981, and four char were captured in Lake Washington by the University of Washington during a multi-year sampling effort between 1984 and 1985 (Beauchamp, unpublished data as reported in KCDNR, 2000).

Additionally, the University of Washington has been conducting sampling activities over the past 16 months (2002 and 2003) throughout Lake Washington. Their surveys have resulted in the collection of one char, approximately 356 mm in length. Because suitable habitat for spawning and juvenile rearing is not available in Lake Washington or its tributaries, it is likely that char found in the area are actively foraging on a variety of prey fish that inhabit the lake (Foley, 2004).

Several other surveys confirm the scarcity of native char. Bull trout were not found in the Sammamish River subbasin during a specific one-year bull trout survey of Lake Sammamish (WDFW, 1998). Additionally, during a one-year survey conducted in Lake Sammamish, only one native char was observed (Bradbury and Pfeiffer, 1992). More recent surveys have yielded the collection of three native char from Lake Sammamish and an associated tributary (KCDNR, 2000). Two char were reported holding below a culvert in the headwaters of Issaquah Creek in the fall of 1993 (Fuerstenburg in KCDNR, 2000). Since there are no physical passage barriers, it is possible that these three fish were anadromous fish that strayed into the Lake Washington system via the Ballard Locks and were not part of local spawning population with the lower two-lake system. Water temperatures in the lower Cedar River and Issaquah Creek are probably too high to support bull trout/Dolly Varden (WDFW, 1998).

The USFWS compiled a list of bull trout/Dolly Varden activity in the Lake Washington/Lake Union/Lake Sammamish Watershed. They reported that between May 1975 and February 1976, eight Dolly Varden ranging in size from 360 mm to 604 mm were collected near the Shuffleton Power Plant and Boeing Plant at the south end of Lake Washington. Since 1981, an additional 10 native char either have been sighted or caught (Beauchamp, unpublished data 2003). None of these fish was definitively identified as bull trout.

Reproducing populations of char in the lower Cedar River, Lake Washington or Lake Sammamish or their tributaries have not been confirmed and are unlikely. Known self-sustaining populations within the Lake Washington basin are limited to the Cedar River subbasin upstream of Lower Cedar Falls at RM 34.2, and within the Chester Morse Reservoir and Rex River (WDFW 1998; KCDNR 2000; KCDNR 2000a).

Presently, only one life history form of bull trout, adfluvial, is known to occur in Chester Morse Reservoir. Resident forms may be present in the upper headwaters of the Cedar or Rex Rivers or within some of their tributaries. Quantitative information concerning life history and abundance of these fish in WRIA 8 is sparse. Redd counts in the upper Cedar River conducted from 1992 to 2000 included a range from 6 redds to 236 redds; however, viewing conditions during some years likely caused an underestimation of the actual number of redds (Kerwin 2001).

With the exception of the population located within the upper Cedar River Municipal Watershed, no self-sustaining native char populations have been identified to date in the Lake Washington basin. Temperatures in most tributaries of the lower Lake Washington system are considered too warm to support native char juveniles and spawners (Bob Pfiefer, WDFW pers. comm. in KCDNR, 2000). In fact, in the Puget Sound region, the downstream limit of successful spawning always occurs upstream of the winter snow line (WDFW, 1999a). This precludes spawning in the Sammamish River subbasin, which does not extend to elevations above the snow line. Therefore, although a scarce few individual bull trout may occasionally enter the water bodies within the action area, including Juanita, Forbes, Cochran, and Carillon creeks, and the Sammamish River, they do not use the area for spawning or rearing and are likely migrants that enter the system solely in search of feeding opportunities.

The low number of char reported may be a function of Lake Washington tributary habitat conditions, but more likely a function of habitat conditions or forage opportunities far outside the project action area. Healthier habitat produces larger populations . Several density dependent factors can influence stray rates or migration activity. Salmonid migrations can be triggered by several different physiological needs, most notably reproduction, but feeding requirements are another factor. Bull trout that migrate through Lake Washington or in the Sammamish River will actively feed. They are aggressive piscivorous predators that will take advantage of the numerous aggregate species in Lake Washington. The quality forage opportunities result in a longer residence time during this feeding behavior. Due to lack of scientific information, these types of bull trout trophic relationships are not well understood within Lake Washington. The trophic role of Lake Washington tributaries related to bull trout is also not well understood. Feeding by larger fish at the mouth of streams where smaller fish species aggregate in preparation for an upstream migration is common. Yet, no bull trout have been observed, sampled, or caught near the mouth of any of the project segment tributaries. Migration and the predator-prey relationship may explain their presence in Lake Washington, meanwhile the lack of habitat (lake and streams) may explain why so few have been sampled.

Morphometric or genetic confirmation may be the only scientific method capable of distinguishing bull trout from Dolly Varden. Habitat requirements are similar for both species of char, but only the bull trout is listed under the ESA.

5.2.3 Critical Habitat

The USFWS is proceeding on Draft Recovery Plans for three of the five distinct population segments of the bull trout. They include inland bull trout stocks of the Columbia River, Klamath River, and St. Mary's Belly Rivers.,

On June 25, 2004, the USFWS proposed critical habitat for the Coastal-Puget Sound population of bull trout. The proposed designation includes the Cedar River from Boulder Creek upstream, to Chester Morse Lake, and Lake Washington It also includes the Sammamish River amd associated tributaries of Lake Washington, as well as the

Ship Canal and Lake Union. Adoption of the proposal depends on several issues. The date for a decision to adopt the designation is uncertain.

The USFWS Matrix of Diagnostics/Pathways and Indicators for Bull Trout (1998) for water bodies within the Lake Washington basin project action area is presented in Table 5-2. Habitat for spawning and rearing is severely degraded within the Project Action Area creeks and rivers.

Table 5-2. Matrix of Diagnostics/pathways and Indicators for Bull Trout

Diagnostics/ Pathways: Indicators	Population and Environmental Baseline			Effect of the Action		
	Criteria	Present condition	Functionality (F/FR/FU)	Restore	Maintain	Degrade
Subpopulation Characteristics; Subpopulation Size	Mean pop. size greater than several thousand individuals	No reproductive populations (adults < 50)	NPF		X	
Water Quality: Temperature (7 day average)	Incubation 36 to 41°F[1] Rearing 39 to 54°F Spawning 39 to 48°F Migration not to exceed 59° F	Forbes, Juanita, Yarrow Creeks; Lake Washington, Sammamish River on 303(d) for temp[2]	NPF (exceeds criterion for all but migration = higher than 59°F[1])		X	
Sediment	< 12% fines in gravel[1] (fines = <6.4 mm)	Excessive erosion and fines may be a problem.	AR/NPF		X	
Chemical Contamination/ Nutrients	Low levels of chemicals; no CWA 303(d) reaches	Moderate levels of chemical contamination likely; Forbes, Juanita, Yarrow creeks; Sammamish River; Lake Washington on 303(d) list[1] ;All direct discharges modified for treatment	NPF		X	
Habitat Access: Physical Barriers	Human made barriers do not restrict passage	Culverts, vaults, and piping in upper Forbes, Juanita, Yarrow, Carillon, Cochran Creek and unnamed urban drainages limit access	AR		X	
Habitat Elements: Substrate Embeddedness	Embeddedness less than 20%; mostly gravel and cobble	Excessive fines likely in urbanized streams	AR		X	

Table 5-2. Matrix of Diagnostics/pathways and Indicators for Bull Trout

Diagnostics/ Pathways/ Indicators	Population and Environmental Baseline			Effects of the Action		
	Criteria	Present condition	Functionality (F/FR/FU)*	Restore	Maintain	Degrade
Large Woody Debris	10 to 20 pieces/100 linear feet; sources of recruitment	Urbanization has resulted in loss of LWD; lacks potential for recruitment	NPF		X	
Pool Frequency	Wetted wdth & pools/mi 0 to 5 ft = 39 pcs/mi 5 to10 ft = 60 pcs/mi 10 to 15 ft = 48 pcs/ mi 15 to 20 ft = 39 pcs/ mi 20 to 30 ft =23 pcs/ mi 30 to 35 ft = 18 pcs/mi 35 to 40 ft = 10 pcs/mi 40 to 65 ft = 9 pcs/mi 65 to 100 ft = 4 pcs/mi	Pool frequency considerably lower than healthy levels (F); reduced LWD and cover elevated temperatures in most action area streams; scour function below normal; fine sediment accumulation likely	NPF		X	
Pool Quality	More than 3 feet deep with good cover	Not functioning properly due to extensive channel modifications and lack of LWD	NPF		X	
Large Pools	Each reach has many large pools (larger than 3 feet)	Not functioning properly due to extensive channel modifications and lack of LWD	NPF		X	
Off-channel Habitat	Numerous ponds and backwaters with cover	Not functioning properly due to extensive channel modifications, such as pipes, culverts, ditches, rip rap, and encroachment; loss of floodplain and natural meanders	NPF		X	
Refugia	Sufficient in size and number to maintain pop.	Adequate refugia does not exist; excessive riparian encroachment	NPF		X	

Table 5-2. Matrix of Diagnostics/pathways and Indicators for Bull Trout

Diagnostics/ Pathways: Indicators	Population and Environmental Baseline			Effects of the Action		
	Criteria	Present condition	Functionality (F/FR/FU)	Restore	Maintain	Degrade
Channel Conditions and Dynamics: Avg. Wetted Width/Max. Depth Ratio	Natural = 10	Not functioning properly due to extensive channel modifications, such as pipes, culverts, ditches, rip rap, and encroachment; loss of floodplain and natural meanders	NPF		X	
Streambank Condition	More than 90% stable or more than 80% of reach has 90% stable	Likely stable in most areas	PF/AR		X	
Floodplain Connectivity	Frequent with over bank	Reduced connectivity to floodplain, wetlands, and refugia due to piping and culverts in some reaches	AR		X	
Flow/Hydrology: Change in Peak/Base Flows	Peak flow, base flow and timing similar to other watersheds	Degraded streams due to high urbanization; more frequent peak flows and lower base flows.	NPF		X	
Increase in Drainage Network	Zero or minimum increase in drainage network	Increase anticipated, but will be mitigated by stormwater treatment improvements	NPF		X	
Watershed Conditions: Road Density and Location	<2mi/mi2; no valley bottom roads	>2.4mi/mi2; highly developed with many valley-bottom roads	NPF		X	
Disturbance History	Less than 15% with no unstable areas	Disturbance short-lived, but moderate to low resiliency	PF/AR		X	

Table 5-2. Matrix of Diagnostics/pathways and Indicators for Bull Trout

Diagnostics/ Pathways Indicators	Population and Environmental Baseline			Effects of the Action		
	Criteria	Present Condition	Functionality (PF/AR/NPF)*	Restore	Maintain	Degrade
Riparian Reserve – Northwest Forest Plan	Riparian corridor at least 80% intact; composed of 50% endemic vegetation	Riparian areas fragmented and less than 25% similarity to historic natural conditions	NPF		X	
Recruitment, Population Structure and Heterogeneity	Healthy subpopulation of bull trout (several thousand individuals) or directly linked to one. All life history modes are possible	Does not support reproductive or rearing life stages; adult presence limited to migration only	NPF		X	

** PF = Properly functioning, AR = At Risk NPF = Not properly functioning*

1 http://www.ecy.wa.gov/programs/wq/303d/2002/wria_pdfs/wria8.pdf

2 Subpopulation Watershed: Lake Washington basin, including Lake Washington and Lake Sammamish and their tributaries

5.3 Bald Eagle

5.3.1 Habitat Requirements/Population Status

Early declines in bald eagle (*Haliaeetus leucocephalus*) populations in Washington and nationwide were attributed to human persecution and destruction of riparian, wetland, and conifer forest habitat, as well as reduction in prey species. However, the widespread use of chlorinated hydrocarbon pesticides that caused eggshell thinning and subsequent reproductive failure was the most important factor in the decline of the species (Detrich, 1985).

Because of declining populations, the bald eagle was federally listed as endangered or threatened within the contiguous 48 states in February 1978. Within Washington and several other northern states, the bald eagle was listed as threatened. Critical habitat for bald eagles has not been established in Western Washington. As a result of increasing populations, the bald eagle was reclassified as threatened throughout the contiguous 48 states in August 1995 (USFWS, 1995). On August 6, 1999, the USFWS proposed to de-list the bald eagle in the lower 48 states (64 FR 36453).

Both the USFWS and WDFW list the bald eagle as threatened. Recovery efforts over the last 25 years, including habitat protection, development and implementation of the Pacific Eagle Recovery Plan (USFWS 1986) and the ban of dichloro-diphenyl-tricholoroethane (DDT) and other organochlorine pesticides, have led to a population increase, which has led to a greater geographic range.

5.3.2 Biological Requirements

Washington hosts one of the largest populations of wintering bald eagles in the lower 48 states as well as one of the largest populations of nesting pairs. The majority of nesting bald eagles in Washington occur west of the Cascade Mountains (Smith et al., (1997). Most bald eagle nests are located within one mile of a lake, river, or marine shoreline, with an average distance from a water body of 635 feet. Nests tend to be closer to rivers and marine shores, rather than lakeshores (Stinson et al., (2001). Bald eagle nests in Washington are usually located in uneven-aged stands with large trees located near water bodies that support a sufficient food supply. Nest trees must be large enough to support nests typically nearly 6 feet in diameter and at times weighing more than a ton (Stalmaster 1987). Their large size requires access to an abundant supply of large fish during breeding (Johnsgard, 1990).

Migrants typically begin arriving at their wintering grounds in October (Roderick and Milner 1991). Wintering bald eagles often congregate in communal roosts to sleep at night or to avoid extreme weather conditions. Communal roosts, many of which are used year after year, are usually located in stands containing the tallest and most open-structured trees available (Keister and Anthony, 1983; Stalmaster, 1987). To protect themselves from inclement weather, bald eagles will roost in areas sheltered from wind, such as depressions or leeward slopes (Stalmaster, 1987). Additionally, coniferous trees are preferred when roosting during inclement weather. The advantages of communal roosting are not known. A study conducted on the north and middle forks of the Nooksack River provided evidence that bald eagles will follow each other from the roost to food sources, thus increasing foraging efficiency (Knight and Knight, 1983). Communal roosts may also act to help establish or maintain pair bonds (Stalmaster et al., (1985).

Perching trees typically offer a commanding view of forage areas. Nesting bald eagles exhibit consistent daily foraging patterns, using the same perches, which usually offer some isolation from human activity. During the winter, eagles may show a preference of deciduous trees when the trees are defoliated, which allows greater visibility of the surrounding area (Stinson et al., (2001).

A small but growing number of bald eagles in Washington are exhibiting an unexpected tolerance to human presence and activities, by nesting successfully in close proximity to homes. This may indicate a local shortage of nesting habitat. Eagles show a strong year-to-year fidelity to a nest territory and are reluctant to abandon a territory despite increased disturbance and habitat alteration. As carrying capacity is reached, less suitable nest sites are discovered and become occupied (Stinson et al., (2001).

The Lake Washington bald eagle population often synchronizes their migration to coincide with the migration of other fish and wildlife populations, including salmon and waterfowl. High concentrations of favorite food items provide numerous forage opportunities along the Lake Washington shoreline, in the open water zone, at the mouth of streams, large wetland areas, and along the larger tributaries. Forage areas are included in critical habitat designations, but the site specific habitat is not designated as such.

5.3.3 Forage Opportunities

Forage opportunities are not exclusive to natural habitat, but natural habitat provides a greater opportunity for success. Concentrations of fish or waterfowl are common near the mouths of streams and along shoreline wetlands. The mouth of all salmon streams, including Forbes, Juanita, Yarrow, and North Creeks are likely forage site for eagles. The open water zone of Lake Washington also provides for forage opportunity. The complex wetland areas in Juanita Bay and at the mouth of Yarrow Creek provide for other quality forage opportunities, in addition to providing perch habitat in the taller canopy trees. Forage activities are not quantifies for regulatory purposes, only roost trees and nest sites. No roost trees or nest sites occur within 1.25 miles of the project.

Population Trends

In 1982, in order to facilitate the recovery of the bald eagle in the lower 48 states, five recovery regions were established. All of Washington State lies within the Pacific Recovery Region. The project site is located within the Puget Sound Bald Eagle Recovery Zone (Zone 4) as delineated in the Bald Eagle Recovery Plan (USFWS, 1986). At the time the recovery plan was written un 1986, 161 known territories existed in this zone with 130 nesting pairs. To meet recovery goals for this zone, the plan specified 156 territories with 115 nesting pairs. Based on bald eagle surveys conducted in 1998, 298 territories were occupied within this zone (Stofel, 1998). There are currently 770 nesting pairs in Washington State (Carey, 2002). The recovery plan also included the following goals for reproductive success to be averaged over 5 years:

- Average reproductive rate of 1.0 fledged young per pair
- Average success rate per occupied territory of not less than 65 percent
- The five-year averages in the Puget Sound Recovery Zone within Washington for these standards following the 1997 breeding season were 0.84 fledged young per occupied territory, and a 53 percent success rate per occupied territory (Stofel, 1998)

5.3.4 Known Occurrences in Project Vicinity

Throughout the corridor, a number of bald eagle nesting territories are located in the vicinity of the project (but outside the Action Area): Due to the sensitivity of the nest locations, the specific information is not included (USFWS species list letter to WSDOT, 2002).

The WDFW (2000) identifies five bald eagle territories near but outside the action area (i.e. over one mile from I-405 construction and operation activities). Bald eagle territories are typically proximate to water with an adequate food source and large trees that provide an unobstructed view of the water body. The foraging territory for these eagles will likely be to the north and west toward Lake Washington.

5.3.5 Designated Critical Habitat

The USFWS has not designated critical habitat for the bald eagle (USFWS 1986).

6.0 Analysis of Effects

The following sections discuss anticipated effects from the activities related to the project. ESA requires that federal agencies consider several types of effects as defined below.

6.1 Direct Effects

- Direct impacts can be categorized into two types:
- Impacts that are a direct result of construction activities
- Impacts caused by the operation of the project

6.1.1 Direct Construction Effects to the Aquatic Environment

Projects that will require construction activities along stream channels have the potential direct impacts to fish habitat including erosion and sedimentation, placement of riprap inside the wetted perimeter of a stream, riparian disturbance, and discharge of toxic pollutants. Construction impacts are temporary, localized, and short- or long-term impacts.

Addition of a culvert under I-405 or redirection of Forbes Creek may require in-water work upstream of three anadromous fish migration barriers . Forbes Creek has not been reported to support any life stage of chinook or bull trout. Therefore, the direct impacts to chinook, and bull trout will be very limited and insignificant and will not adversely affect listed species.

Four offsite wetland mitigation projects will be constructed in order to compensate for the loss of wetland functions due to construction impacts with freeway ROW. The locations include three within the Forbes Creek drainage and one within the North Creek drainage. Since the primary purpose of compensatory mitigation is to provide beneficial action, the negative impacts from construction will be limited and short term. There will be no in water work at any of the mitigation sites. The project sites will be isolated from any surface water, streams, and lakes. The isolation will minimize impacts from erosion and other project activity. Any work within 300 feet of North Creek will be scheduled during the normal fish work window to avoid and minimize impacts to listed chinook. See section 6.1.1.1 for further discussion on avoiding or minimizing impacts not adversely affect listed species.

Juanita Creek and two of its tributaries and Forbes Creek flow within culverts under I-405. The Sammamish River flows under the elevated freeway interchange at SR 522. Yarrow Bay Creek crosses under I-405 but not within the project footprint. The Sammamish River and Yarrow Bay Creek are within the Project Action Area, and are thus included in this discussion. North Creek is within the Project Action Area, but does not flow within 300 feet of the project area except at one wetland mitigation site. Also, chinook inhabit the stream within 300 feet of the project. Impacts to North Creek will be beneficial because the mitigation site will enhance an existing wetland. The remaining streams and unnamed drainages within the project action area originate farther than 300 feet from the existing I-405 footprint, and none of them flow under the freeway.

6.1.2 Temporary Water Quality Impacts

Increased Turbidity and Other Deleterious Materials

The construction contractor will be required to complete an SPCC and TESC plan before commencing activities. Implementation of these plans will prevent erosion impacts and impacts from deleterious material spills to project streams. During an extreme weather event, such as a 100 yr event, soil erosion is common, especially along the I-405 Corridor. The contributing are exacerbated near construction sites, although the SPCC and TESC plans will reduce the impacts to Juanita, Forbes and North Creeks, and the Sammamish River even during these types of events.

Another source of Impacts to water quality during construction is automotive-related substances such as petroleum hydrocarbons and heavy metals. These substances are found in staging areas, on temporary roads, or on other work surfaces such as the highway. Contaminants may reach concentrations sufficiently toxic to aquatic life if accidentally discharged directly into surface waters. Implementation of the SPCC will minimize the impacts to streams that are from automotive related substances.

Excessive increases of fine sediments and pollutants pose a risk to productivity of an aquatic environment and to the existence of all salmonid populations. Although isolating a single effect is very difficult, the following descriptions characterize the varying levels of risk:

- Lethal – direct mortality to any life stage
- Sub-lethal – increased stress of any life stage, which may lead to mortality, or
- Behavioral – changes in feeding, habitat selection, foraging, mobility, or homing

Research biologists (Cederholm et al 1978, Scott 1982) have documented the following ten variables for the different salmon species and sometimes by specific stock: duration of exposure, frequency of exposure, toxicity, temperature, particle size, life stage impacts, magnitude of pulse, timing, health of biota, and access to refugia. It is difficult to address which environmental variable is the key to assessing sediment impacts on fish life at a particular site. Additionally, there may be other limiting factors present.

Mechanisms of Impacts

Sedimentation in spawning habitats blocks the flow of oxygenated water through the gravel substrate, reducing emergence and survival of juvenile salmonids. This may also adversely affect other resident fish, including sculpins, which depend upon intragravel habitat throughout their life history. Sedimentation can also affect fish by reducing the aquatic prey base. Aquatic insects typically are a necessary food source for salmonids.

Sedimentation impacts vary depending on the size of the stream, time of the year, the fish species, and other environmental variables. Some studies show that fish avoid low-quality water conditions, such as excessive levels of turbidity, by moving out of the stream area. Others show that young salmon are not displaced by high water or pollutants (Scott et al., 1978; Cedarholm and Reid, 1987).

The real debate may be the short-term versus the long-term impacts. The physiological effect of excessive turbidity can be reduced growth, reduced resistance to disease, increased stress, or interference with homing or migration behavior (McLeay et al., 1987; Newcombe and McDonald, 1991; and Bash et al., 2001). Although increased turbidity is a natural phenomenon during spring flows when juvenile salmon migrate out of a system, it can adversely affect forage species. Juvenile salmon typically achieve higher survival rates by taking advantage of the turbid conditions, hiding from predators at this time. Another favorable factor for juvenile salmon during these conditions is the rapid downstream movement during high spring flows. Regardless, excessive sedimentation has other detrimental impacts and will be avoided.

Measures to Reduce Potential Impacts

- Direct impacts to threatened or endangered species will be negligible during construction because of the lack of chinook and bull trout habitat near and within the project area. The contractor will implement conservation measures to ensure minimal or no impacts on ESA species:
- All work areas will be isolated from the surrounding water bodies by a properly installed erosion control fence or sediment sieve. .
- For control of pollutants other than sediment, the contractor will develop and implement a Spill Prevention Control and Countermeasures (SPCC) Plan. This plan must address activities such as waste disposal methods and locations; control of oil, gasoline, and solvents used in the operation and maintenance of vehicles and machinery; emergency spill control and containment measures; material storage; and waste accumulation. The SPCC plan will detail ways to prevent pollution from these activities from entering Waters of the State. The contractor will be responsible for revising the plan as necessary to conform to the actual operations and unanticipated activities as construction progresses.
- Contractors will be required to check all equipment for leaks on a daily basis.
- When feasible, work timing windows will be established and implemented to minimize construction activities around aquatic environments. Limiting certain activities to the work windows will minimize potential impacts to fish life.
- The contractor will develop and implement a TESC plan for the project to prevent sediments from entering water bodies during construction.
- Projects that require bank stabilization, such as riprap used to minimize erosion and headcutting at the Forbes Creek/I-405 culvert will follow the *Washington State Aquatic Guidelines Integrated Streambank Protection Guideline* (2003) as much as is practicable.

6.1.3 Noise from Construction Equipment

Noise levels from operation of machinery during certain construction activities will exceed ambient conditions and noise may cause temporary, short-term, or localized increases in airborne sound events. Noise generated by operation of construction equipment in or directly over a stream may affect salmonids. Noise from construction equipment may also affect bald eagles that forage near the wetland mitigation sites at lower Forbes Creek along the Lake Washington shoreline and near North Creek. . Potential effects will be minimized through the conservation measures listed below.

Mechanism of Impacts

The vibratory energy and noise of construction equipment can impact fish species if the origin of the noise is in close proximity to water. The vibratory energy and noise level will vary depending on the type of equipment and length of noise generated.

Research biologists (Feist et al., 1986; Jones and Stokes, 2003) have studied evasive response or behavior by salmonids from noise impacts however, it is not well understood. Scientists speculate that excessive noise may impact adults as well as juveniles. The migratory periods often represent the most sensitive life phase. Additionally, salmonid juveniles may abandon refuge or feeding areas that could result in an increased exposure to predation. Fright and flight behavior is common in the animal world. Schwarz and Greer (1984) studied this type of behavior in Pacific herring and found an avoidance behavior from excessive sound. Sound can also affect growth rates, fat stores, and reproduction in some species of fish (Meier and Horseman, 1977; Banner and Hyatt, 1973). Auditory masking and habituation to excessive noise levels may also decrease the ability of salmonids to detect approaching predators (Feist, 1991; Feist, et al., 1996).

If the airborne noise generated from the construction equipment is above normal ambient levels, it could potentially affect nesting bald eagles up to one mile from the project location. Loud noises can displace bald eagles from forage activities and flush adults from nests. The flushing of adult from a nest is not likely to occur within one mile of the construction activities because there are no nests within one mile of the construction activities.

Bald eagles nest near shorelines and are generally intolerant of human activities during the nesting season. Mechanized equipment can generate noise levels of approximately 60 to 110 decibels (dB). The shoreline of Lake Washington and areas along the Sammamish River and various streams are moderately to heavily developed with residential homes and commercial and industrial facilities. Noise within the Lake Washington Basin results from airplane traffic associated with Seattle-Tacoma International Airport, Boeing Field, Renton Field, and private planes equipped for takeoff and landing on Lake Washington. Vehicle traffic associated with I-90 and 405, SR520 and 522 and the numerous side streets near the shorelines in the basin, as well with commercial and recreational boating all contribute to increasing the ambient noise levels within the action area.

The ambient noise levels in the Lake Washington Basin likely vary from 35 dBA, the ambient level of a semi-rural area, to 64 dBA, the ambient noise level near a freeway. The ambient noise level of a construction site near the freeway is likely higher than during normal freeway operations.

Measures to Reduce Potential Impacts

The duration of construction equipment activities and the probability that those activities will affect listed species will be minimized by:

- No in-water work
- Maintaining exhaust systems on the equipment, especially equipment used near sensitive areas
- Adhering to timing restrictions (late October though March) if a nest is constructed within one mile of the project
- Applying sound attenuation barriers (which also serve as a light barrier) wherever appropriate
- Observing work distance guidelines provided by WDFW and USFWS

6.1.4 Removal of Freeway Buffer Vegetation

Removal of freeway buffer vegetation has only minimal impact unless the vegetation serves as a riparian area for a stream or wetland near the freeway. The following discussion describes the riparian and upland vegetation areas near streams with impacts. There will be minimal permanent removal (less than ¼ acre) of shrubs and trees in the riparian areas associated with Forbes Creek during the culvert replacement under I-405. Removal of shrubs and trees near the NE 160th Street interchange that are associated with stormwater modifications along the freeway are within the freeway ROW. The total amount removed near NE 160th interchange will be less than 0.5 acres. Both impact areas near NE 160th will be mitigated for as wetland impacts. The drainage area is a natural ravine with no fish present. Other than at Forbes Creek, the sites no not function as a riparian zone associated with a fish bearing stream.

Except for the mitigation sites, all the other cases of vegetation removal, the habitat is either wetland buffer or upland grassland and forest. Other than at Forbes Creek, all the affected wetland riparian areas (less than 2.5 acres of wetland) will be within the ROW, and do not have surface water connection to perennial fish bearing streams.

Additionally, most of the wetland impact areas are associated with stormwater treatment sites that are maintained as wetlands for treatment purposes. Removal or disturbances at the stormwater treatment sites will be temporary. Otherwise, permanent impacts to treatment sites will be mitigated by other improved treatment facilities. The wetland mitigation projects will restore and enhance wetland and riparian areas. There will be no long term negative impacts to native riparian functioning habitat associated with a perennial fish bearing stream. The road project and the wetland mitigation sites will be designed to avoid and minimize impacts to natural vegetation areas near fish bearing streams. In all cases, the affected wetland riparian areas will be within the right-of-way, and they surround non-jurisdictional wetlands or stormwater treatment areas maintained as wetlands for treatment purposes. Removal or disturbances at the stormwater treatment sites will be temporary. Otherwise, permanent impacts to treatment sites will be mitigated by other improved treatment facilities. There are no plans for removal of functioning scrub shrubs or trees outside the right-of-way, and no plans for removal of riparian cover near Juanita or Forbes Creek. Direct effects and conservation measures to minimize the impacts are described below.

Mechanisms of Impacts

Riparian vegetation shades stream and wetland areas and can moderate water temperatures. Riparian vegetation can provide a source of large woody debris (LWD), such as in Forbes Creek. The LWD provides cover for juvenile salmonids as well as other fish. Riparian vegetation that overhangs the water provides habitat for terrestrial invertebrates that may fall into the water, as well as provide leaf litter that aquatic invertebrates feed upon. Both terrestrial and aquatic invertebrates provide forage for juvenile salmonids. LWD has many beneficial functions for riparian and stream habitat.

The reduction of riparian woody vegetation is the primary cause of reduced LWD recruitment potential, which results in a reduction of habitat components for salmonids.

Measures to Reduce Potential Impacts

To minimize potential impacts to eagles and fish life, shrubs and riparian trees at Forbes will only be removed if required as part of the construction of the new cross culvert. No perch trees will be removed. Any short term impacts will be mitigated by revegetation of like kind vegetation at the site and placement of LWD in the stream to replace the lost function of woody debris recruitment. For all other sites, removal of riparian vegetation will be limited to the minimum amount necessary to accomplish each project. Disturbed areas will be revegetated with native plants and a 5-year monitoring plan will be implemented.

6.1.5 Direct Operational Impacts to the Aquatic Environment

Operational impacts are direct impacts caused by the long-term existence of the project and will potentially have perpetual effects on the resource. In this analysis, the potential for direct operational impacts is assessed and calculated by the area of new impervious surface created by the project. The primary potential operational impacts to stream habitat will result from new impervious surfaces and subsequent increases in stormwater production. Potential direct operational impacts are quantified as new impervious surface in Table 1 for the four basins within the Project Action Area. Another area of potential operational direct impact on the aquatic environment is Yarrow Bay Creek. Direct impacts to fish life will be limited to those projects in streams that support fish life. Forbes and Juanita Creeks are the only streams with fish life that cross within the project boundaries. The installation of a properly-constructed culvert at Forbes Creek (a fish bearing stream) will benefit fish life, although not listed species. There is no in-water work scheduled for Juanita Creek.

New stormwater treatment facilities will be constructed and existing infrastructure will be modified to reduce direct impacts to streams. All direct discharges will be removed from streams and redirected into standard treatments per the HRM. Otherwise, the impacts will be addressed as indirect impacts manifested through to other ecological mechanisms.

Mechanisms of Impacts

Impacts associated with an increase in impervious surfaces could result in increased hydrologic changes to wetlands and streams in the project area. Road widening and new road surfaces will collectively create 15.06 acres of new impervious surface area within the action area. This includes the Juanita and Forbes Creek basins and the Sammamish River basins. An additional 19.88 acres of existing impervious surfaces will be retrofitted with improvements for quantity and/or quality stormwater treatments.

Potential effects of the additional new facilities will facilitate reduction in impacts to riparian vegetation, toxic pollution, and alteration of hydrology. Even modern water quality treatments are not 100 percent efficient; however, by including sites within the project area that currently have direct discharge (i.e., no treatment), retrofitting represents environmental baseline improvements for some streams and natural wetlands.

Several smaller basins exist within the Project Action Area. They include Yarrow Creek, Cochran Springs Creek, Carillon Creek, Moss Bay Creek, Everest Creek, and two unnamed small tributaries. The project will not impact these streams.

6.1.6 Quality and Quantity Treatment of Stormwater

The project will result in approximately 15 acres of new impervious surface. Stormwater flow control and quality treatment will be provided for new impervious surface as appropriate according to the WSDOT Highway Runoff Manual (2004), which is consistent with the Ecology 2001 Stormwater Management Manual for Western Washington.

In most cases, these documents require water quality treatment for more than 100 percent of new impervious surfaces and detention of the 2-year through 50-year storm events. Additional design references and guidelines will be used as they apply for local jurisdictional requirements, particularly those guidelines established by the King County *Surface Water Design Manual* (1998).

The project section stretches approximately 8 miles from the SR 520 interchange to the SR 522 interchange. Defined drainage basins (Table 1, Figure 11a -11c) for the entire project encompass a total area of approximately 536 acres. Overall, the project will add approximately 15 acres of new impervious surface.

In addition to providing enhanced treatment for the new pavement areas, approximately 20 acres of presently untreated impervious surface will be retrofitted for enhanced water quality treatment. These improvements will be provided in accordance with the WSDOT *Highway Runoff Manual* in the form of combined treatment basins, ecology ditches and embankments, and water quality wetlands. Ecology ditches and embankments are the preferred method of treatment because of their flexibility in construction, enhanced treatment capabilities, and relative low cost.

Stormwater detention will be provided for approximately 14acres of new pavement project wide. This is less than the new pavement area of approximately15 acres because the project has been divided into 17 separate threshold discharge areas (TDAs). New pavement for several of these TDAs does not exceed the flow control treatment threshold (as previously described). Thus, no detention will be required for those areas. However, detention will be provided in accordance with the WSDOT *Highway Runoff Manual* in the form of detention/retention ponds and detention vaults. Infiltration will be used whenever possible to discharge stormwater or otherwise reduce flow control treatment volumes. Current information about surrounding soils and geologic formations does not encourage widespread use of infiltration as a viable method of discharging stormwater for this project. However, it is believed that pockets of well-draining soils in some upland areas exist along the corridor, and testing is currently being conducted to identify areas where infiltration is feasible.

Existing drainage structures and systems will be retained in the project area as much as practicable. New structures will be added as needed to incorporate treatment facilities or mitigate existing drainage issues. Inlets will be placed at locations necessary to limit the spread of design flows into the travel lanes, as required by the WSDOT *Hydraulics Manual.*

Where space and structure access make it possible, open roadside ditches will be used as the preferred conveyance feature. Wherever the pavement discharge will be conveyed into a ditch, an ecology ditch will be constructed where possible to provide enhanced treatment of the runoff. Open ditches on the edges of the shoulders will be the preferred collection system where right-of-way and grading conditions allow. Existing drains and ditches will be used to the extent possible.

Watersheds in the Project Area

The project spans four primary watershed basins, beginning south to north. They include:

- Lake Washington East-Bellevue North
- Forbes Creek
- Juanita Creek

Table 6-1: Summary of Water Quality Treatment by Sub-basins

Basin	[illegible] (TDA) Area (acres)[1]	Existing Impervious Area (acres)	New Impervious Area (acres)	Total Impervious Area Being Treated (acres)	Percent of New Impervious Area Treated
Lake Washington East – Bellevue North Watershed					
Basin A	120.6	62.2	1.30	5.72	
Basin B	122.53	60.35	0.20	0.36	
Total	243.13	122.55	1.50	6.08	405%
Forbes Creek Watershed					
Basin C	61.00	25.70	8.90	9.43	106%
Total	61.00	25.70	8.90	9.43	106%
Juanita Creek Watershed					
Basin D	132.12	63.8	1.63	8.94	
Basin E	37.50	16.53	2.01	5.49	
Total	169.62	80.33	3.64	14.43	396%
Sammamish River Watershed					
Basin F	62.42	26.17	1.02	5.00	490%
Total	62.42	26.17	1.02	5.00	490%
Project Total	536.17	254.75	15.06	34.94	232%

[1]Includes I-405, interchanges, and surface streets

- Sammamish River

For the purposes of storm drainage analyses and design, the watersheds listed above are further subdivided into six watershed sub basins delineated by high and low points along the corridor profile. Figures 11A, 11B and 11C show the locations of the watershed sub basins and treatment facilities in the project vicinity. Table 1 summarizes existing and new impervious surface area for each basin, as well as the percent of new impervious surface area to receive water quality treatment.

6.2 Indirect Effects

This project will address current and anticipated traffic conditions, primarily congestion and traffic flow within the project area, along the I-405 Corridor and associated arterials. Although significant changes in highway capacity have the potential to influence land development, the lack of changes in access will have minimal impact on land use (it is anticipated that there will be only a 1.1 and 1.9 percent increase in employment and households, respectively, throughout the corridor over the next 20 years) (refer to the Land Use and Growth Analysis). Therefore, land use changes in the immediate vicinity of the interstate projects, including additional land development, are not anticipated as a result of the action.

There will be indirect long term benefits to fish life at all four wetland mitigation sites because they are located adjacent to fish bearing streams. The indirect benefits include but are not limited to:

- Reduction in sediment loading
- Reduction in water temperatures
- Normalization of nutrient loading (decreased nitrates, nitrites, phosphorous, heavy metals, etc)
- Improvement of localized woody debris recruitment
- Improved floodplain functions
- Reduction in unnatural erosion

6.2.1 Land Use

Development is managed by local jurisdictions through the Growth Management Act and by other means, including state and local permitting, comprehensive plans, and critical areas regulations. All of these regulations require that a land development project pass a rigorous environmental "test" to assure that listed species and their habitats are protected.

Although this project may increase capacity along this portion of the I-405 Corridor through the addition of lanes in both the north and southbound direction, it is difficult to determine whether changes actually increase the capacity, or simply move existing traffic more efficiently.

Indirect or secondary land use impacts will be limited and unlikely for the I-405 Corridor Program for several reasons:

All of the I-405 Corridor Program action alternatives are generally compatible with existing regional and local land use plans that already address growth.

A similar level of projected growth is expected to occur in the region, with or without the action alternatives. The difference could be an increase of 1.1 and 1.9 percent in employment and households throughout the corridor. The impact from this project will be a fraction of those percentages.

The Land Use and Growth Analysis (WSDOT 2004) provides and in-depth analysis of the corridor wide impacts to land use resulting from full implementation of the I-405 Congestion Relief and Bus Rapid Transit Projects.

Within the zone of influence and within the project action area of the project there are several fish bearing streams that will be impacted b stormwater facilities and related activities. The indirect beneficial effects include improvement of water quality in Forbes and Juanita Creeks and the Sammamish River and various other unnamed tributary streams. The new and modified stormwater treatment facilities will provide numerous beneficial indirect effects as described above in Section 6.2

6.3 Cumulative Effects

Cumulative effects are those effects of future state or private activities, not involving federal activities, that are reasonably certain to occur within the action area of the federal action subject to this consultation (50 CFR § 402.02), but that are not a result of this project.

It is the responsibility of the USFWS and NOAA Fisheries to review all federal actions and cumulative effects of all state and private actions when consulting under the Endangered Species Act. The conclusions of this biological assessment are based upon the direct and indirect effects and the interrelated and interdependent actions of the project, not the cumulative effects. The possible cumulative effects in this section are provided for the federal agency information only.

The Land Use and Growth Analysis prepared as a support document for this biological assessment indicates that there will be a 1.1 to 1.9 percent change in employment and households as a result of the I-405 projects. The I-405 projects support planned growth within the Urban Growth Boundary; they have only minimal impact on growth inducement.

Transportation programs included in *Destination 2030* (PSRC, 2001), including I-405, I-5, and Trans-Lake Washington programs, are expected to increase pressure for growth along major transportation corridors within the Urban Growth Area (UGA), thus relieving pressure and reducing adverse effects on the rural areas that contain the most functional fish habitat. Activity for the entire I-405 Corridor Program, in which this project portion is included, will influence pressure for growth in this manner. However, since the I-405 Corridor Program improvements are only a portion of the overall Metropolitan Transportation Plan (MTP), the differences among the I-405 action alternatives described in the Corridor FEIS will not alter the overall cumulative effect of the MTP and planned growth and development to a meaningful degree.

6.4 Interrelated and Interdependent Actions

An interrelated action is one that is part of the action and depends on the action for its justification. An interdependent action is one that has no independent utility apart from the action under consultation.

Because the project is one component of the entire I-405 Corridor improvements, all such actions are interrelated and interdependent. Project biologists will analyze each component for compliance with the ESA under separate consultations. Because a similar level of projected growth is expected to occur in the region, with or without this project, and because the project will not result in additional actions that lack independent utility apart from this project, interrelated or interdependent actions will not likely result from the proposal. The exception to this will be the development of compensatory mitigation for the loss of less than three acres of wetlands. WSDOT will provide compensatory mitigation at the required replacement ratios and will replace the lost functions of these wetlands with even greater functions than required.

7.0 Performance Standards

The following performance standards will be applied to each activity within this project. These measures are, for the most part, similar to the *No Effect* and *Not Likely to Adversely Affect* Programmatic Biological Assessment Working Document for NOAA Listed Species (WSDOT, 2002).

7.1 Erosion Control

Project contractors will develop and implement a Spill Prevention, Control, and Countermeasures (SPCC) plan will be developed and implemented for the project to ensure that all pollutants and products are controlled and contained.

National Pollution Discharge Elimination System (NPDES) construction permit requirements will be adhered to.

Project contractors with follow Section 401 Water Quality Certification conditions. All applicable state and local water quality standards will be complied with and the most stringent standards will be followed.

All exposed and disturbed soils will be stabilized during the first available period, and will not be left untreated for more than 7 days without receiving the erosion control specified in the TESC plan. No disturbed soils will remain untreated for more than 2 days from October 1 to April 30, and for more than 7 days from May 1 to September 30.

A Stormwater Site Plan will be developed and implemented. The Stormwater Site Plan will include a SPCC Plan, a TESC Plan, a Hydraulic Report, a BMP selection form, and a BMP maintenance schedule.

7.2 Water Quality

Stormwater management measures described in the approved HRM will be in place at the time of construction.

No paving, chip sealing, or strip painting will be initiated in rainy weather.

The contractor will protect all inlets and catchments from fresh concrete, tackifier, paving, or paint striping if inclement weather unexpectedly occurred.

7.3 Staging

No contractor staging areas will be allowed within 90 meters (300 feet) of any wetland, stream, or river with listed species.

Temporary material storage piles will not be placed in the 100-year floodplain between October 1 and May 1. Material used within 12 hours of deposition will not be considered a temporary material storage pile. All temporary material storage piles will be protected by appropriate BMPs to prevent sediments from leaving the piles.

When practicable, all fueling and maintenance of equipment will occur more than 90 meters (300 feet) from the nearest wetland, ditch, or flowing or standing water. (Fueling large cranes, pile drivers, and drill rigs over 90 meters (300 feet) away may not be practicable.)

Project contractors will confine construction projects to the minimum area necessary to complete the project.

Project contractors will flag boundaries of clearing limits associated with site access and construction to prevent ground disturbance outside the limits.

7.4 Grubbing and Clearing

Vegetation will only be grubbed from areas undergoing permanent alteration. No grubbing will occur in areas slated for temporary impacts.

7.5 Lighting

No temporary project lights, including mobile units, will reflect directly on any waters known to contain listed fish life.

Within 300 feet of waters known to contain fish life, all temporary project lighting will be minimized between sunset and sunrise from November 1 to January 15, and from March 15 to May 15.

7.6 Fish and Wildlife

Work will not inhibit passage of any adult or juvenile listed salmonid species throughout the construction periods or after project completion.

Construction equipment will not enter any water body with listed species. Equipment will be operated as far from the water's edge as possible.

All culvert replacements or extensions will be in accordance with Fish Passage Design at Road Culverts: A Design Manual for Fish Passage at Road Crossings (WDFW, 1999).

Culvert extensions, replacements, or maintenance will occur during construction windows defined in the HPA.

7.7 Bank Protection

Installation of riprap and other material will occur from the banks or outside the wetted perimeter as much as possible.

Projects that include bank stabilization, i.e., riprap along a stream bank, will follow the *Washington State Aquatic Guidelines Integrated Streambank Protection Guidelines* (2003) as much as is practicable.

Living plant material and large woody debris (LWD) will be incorporated in bank protection designs where appropriate.

7.8 Restoration and Revegetation

Revegetation of construction easements and other areas will occur within the first growing season after the project was completed. To the extent feasible, all disturbed riparian vegetation will be replanted. Trees will be planted when consistent with highway safety standards. Riparian vegetation will be replanted with species native to the region.

Large woody debris in any landslide material will be left in the riparian area, retained for future restoration use by WSDOT, or donated to a local watershed group if the need exists.

Disturbed areas will be replanted with native plant species

7.9 Miscellaneous

The project contractor will implement spill control measures at each construction site to prevent an uncontrolled release of fuels from entering receiving waters through stormwater runoff.

- For projects involving concrete mixing, concrete truck chute cleanout areas will be established to properly contain wet concrete and washwater.
- All concrete will be poured in dry conditions, or within confined waters not connected to surface waters, and will be allowed to cure a minimum of 7 days before contact with surface waters.
- All project deleterious materials will be retrieved and will be disposed of at an approved upland disposal site.
- All excavated material will be removed and placed in upland locations where it cannot enter Waters of the State.
- All fill material will be placed according to project design, not randomly dumped.
- Temporary fills will be entirely removed and the site restored to pre-existing conditions.

8.0 Effects Determinations

A summary of recommended effect determinations for all listed known to occur within the action area is presented in Table 3. Rationale for effect determinations for each species follows.

Table 8-3. Summary of Determination of Effects

Federally Listed Species	Status	Determination of Effects
Puget Sound chinook	Threatened	May affect –not likely to adversely affect
Puget Sound Bull Trout	Threatened	May affect - not likely to adversely affect
Bald Eagle	Threatened	No effect

8.1 Puget Sound Chinook Salmon

Site disturbances may disrupt the behavior and distribution of individual fish adjacent to and downstream of the activities, but the overall biological impacts to listed species will be insignificant. With the exception of the Sammamish River, where no constructrion will occur, there have been very few documented Chinook in Juanita Bay or any of the streams located within this project area. A *may affect, not likely to adversely affect* determination for chinook was made due to the following reasons:

- No instream work is planned for any of the water bodies that may be used by chinook, primarily the Sammamish River.
- Although King County (2001) reported chinook habitat extending to I-405 in Juanita Creek, researchers have found no chinook use; in addition, there are several upstream migration barriers in both Juanita and Forbes Creeks (The Watershed Company, 1998; Kerwin, 2001; Ludwa et al., 1997; King County, 2002, 2003).
- Compared to baseline conditions, the amount of stormwater runoff generated is likely to increase. However, all project runoff will have enhanced treatment prior to entering any water body, including natural filtration, which should improve water quality and mitigate water quantity when compared to existing conditions. Although the majority of treated runoff will not discharge directly into chinook-bearing streams, most streams do eventually flow to areas containing the species (i.e. to Lake Washington).

8.2 Bull Trout

Bull trout/Dolly Varden use within the action area is extremely limited and likely occurs only occasionally in cases when individuals are migrating. There have been very few sightings of bull trout/Dolly Varden in Lake Washington and none have been reported in Juanita Bay or any of the streams located within this project area. Further, the habitat that is available in any of the potentially impacted streams is unsuitable for bull trout. Given the unlikelihood that bull trout can or will use these streams, this project *may effect but will not likely adversely affect* bull trout for the following reasons:

- Species is not present in the streams, currently or historically
- Species habitat requirements exclude reproduction, rearing, and migration
- Species has minimal adfluvial presence
- No migration corridors exist within the Action Area
- Minimized impacts on forage species
- Project water quality treatment improvements will minimize impacts on fish life

8.3 Bald Eagle

Improvements along the project portion of the I-405 Corridor may include high-level noise-producing activities including jackhammer use and subsequent equipment operation. These activities will produce noise that is likely to disturb wildlife within a mile of the site. Because of the extent of the actions, the high noise level activities may occur year-round. However, in this section of the I-405 Corridor, no nesting territories are documented within the action area (one nest over 1.25 miles and not in line of sight of I-405).

All activities will take place within or adjacent to the existing interstate right-of-way and will therefore not require the removal of large, dominant trees that may provide opportunities for bald eagle roosting or perching in the immediate vicinity. Because the habitat within the action area is highly disturbed, any occasional use of the area by bald eagles will likely continue as eagles in the vicinity have become accustomed to human activities in the urban environment.

No documented perch trees and no nesting occur within 1.25 miles of the project. No pile driving will be part of this project. Eagles tend to forage toward and over Lake Washington to the west of the project. For these reasons, the project will have *No Effect* on bald eagles.

9.0 References

Allen, M. A. and T. J. Hassler. 1986. Species Profiles: Life Histories and Environmental Requirements of Coastal Fisheries and Invertebrates (Pacific Southwest): Chinook Salmon. U. S. Fish and Wildlife Service Biological Report 82 (11.49), U. S. Army Corps of Engineers, TR EL-82-4. 26 pp.

Atkinson, C. E., J. H. Rose, and T. O. Duncan. 1967. Pacific Salmon in the United States. In: *Salmon of the North Pacific Ocean.* Part iv: Spawning populations of North Pacific Salmon. Int. North Pac. Fish. Comm. Bull. 23. pp 43-223.

Banner, A. and M. Hyatt. 1973. *Effects of Noise on Eggs and Larvae of Two Estuarine Fishes.* Trans. Am. Fish. Soc. 102:134-136.

Bash, L., C. Berman, and S. Bolton. 2001. *Effects of Turbidity and Suspended Solids on Salmonids.* Center for Streamside Studies, University of Washington, Seattle, WA.

Beacham, T. D. 1982. Fecundity of Coho Salmon (Oncorhynchus kisutch) and Chum Salmon (O. keta) in the Northeast Pacific Ocean. Can. J. Zool. 60:1463-1469.

Beauchamp, D. A. 2003. Unpublished data.

Beauchamp, D. A., M. F. Shepard and G. B. Pauley. 1983. Species Profiles: Life Histories and Environmental Requirements of Coastal Fisheries and Invertebrates (Pacific Northwest): Chinook Salmon. U. S. Fish and Wildlife Service Biological Report 82. U. S. Army Corps of Engineers, TR EL-82-4. 15 pp.

Booth, D. B., J. R. Karr, S. Schauman, S. P. Konrad, S. A. Morley, M. G. Larson, P. C. Henshaw, E. J. Nelson, and S. J. Burges. 2001. Urban Stream Rehabilitation in the Pacific Northwest. *The Washington Water Resource.* Quarterly report of the Center for Urban Water Resources Management. Vol. 12, No. 1, pp 1-11.

Booth, D. B. and L. E. Reinelt. 1993. Consequences of Urbanization on Aquatic Systems - Degradation Thresholds, Stormwater Detention, and the Limits of Mitigation. *Water Resources Bulletin,* v. 33, pp 1077-1090.

Bowerman, J, T. Cummings, S. Duke, M. Faler, R. Hallock, S. Lohr, L. Nordstrom, and R. Rhew. 1998. Final Rule. Endangered and Threatened Wildlife and Plants: Determination of Threatened Status for the Klamath River and Columbia River Distinct Population Segments of Bull Trout. Federal Register: June 10, 1998 63 (111) pp. 31647-31674).

Bradbury, A and B. Pfeifer. 1992. Lake Sammamish Creel Survey- 1982-83, Part IV. *Fisheries Investigations of Lake Washington and Sammamish. 1980-1990.* Washington Department of Fish and Wildlife. Unpublished draft report.

Buchanan, D. M. and S. V. Gregory. 1997. Development of water temperature standards to protect and restore habitat for bull trout and other cold water species in Oregon. In Mackay, W. C., M. K. Brewin and M. Monita. Friends of the Bull Trout Proceedings pp. 1-8.

Burner, C. J. 1951. Characteristics of Spawning Nests of Columbia River Salmon. Fish. Bulletin. Fish and Wildlife Service. 61:97-110.

Carey, M. 2002. Washington State Department of Transportation Biologist and ESA Coordinator. Data from Biological Assessment Workshop. February 2002.

Carrasquero, J. 2001. *Over-Water Structures: Freshwater Issues.* White Paper prepared for the Washington Department of Fish and Wildlife, Washington Department of Ecology, and the Washington Department of Transportation.

Casillas, E., L. Crockett, Y. deReynier, J. Glock, M. Helvey, B. Meyer, C. Schmitt, M. Yoklavich, A. Bailey, B. Chao, B. Johnson and T. Pepperell. 1998. *Essential Fish Habitat West Coast Groundfish Appendix.* National Marine Fisheries Service. 778 pp.

Cederholm, C. J., and L. M. Reid. 1987. Impact of Forest Management on Coho Salmon (Oncorhynchus kisutch) Populations of the Clearwater River, Washington: A project summary. Chapter Thirteen, In: Ernest O. Salo and Terrance W. Cundy (eds.), *Streamside Management: Forestry and Fishery Interactions*, Proceedings of a Symposium held at University of Washington, 12-14 February 1986. Contribution No. 57, Institute of Forest Resources, Seattle, Washington. pp. 373-398.

Cederholm, C. J., L. C. Lestelle, B. G. Edie, D. J. Martin, J. V. Tagart, and E. O. Salo. 1978. The Effects of Landslide Siltation on the Salmon and Trout Resources of Stequaleho Creek and the Main Clearwater River, Jefferson County, Washington, 1972-1975. *University of Washington, Fisheries Research Institute Final Report FRI-UW-7804*, Seattle, WA.

Chapman, D. W., and E. Knudsen. 1980. *Channelization and Livestock Impacts on Salmonid Habitat and Biomass in Western Washington.* Transactions of the American Fisheries Society 109:357-363.

Crone, R. A. and C. E. Bond. 1976. Life History of Coho Salmon (Oncorhynchus kisutch), in Sashin Creek, Southeastern Alaska. Fish Bulletin. 74:897-923.

Detrich, P. J. 1985. The status and distribution of bald eagles in California. M. S. Thesis. California State University, Chico, CA.

Feist, B. E. 1991. Potential Impacts of Pile Driving on Juvenile Pink (Oncorhynchus gorbuscha) and Chum (O. keta) Salmon Behavior and Distribution. MS Thesis. University of Washington. Seattle, WA.

Feist, B. E., J. J. Anderson and R. Miyamoto. 1996. Potential Impacts of Pile Driving on Juvenile Pink (Oncorhynchus gorbuscha) and Chum (O. keta) Salmon Behavior and Distribution. FRI-UW-9603. Seattle, WA. Fisheries Research Institute. University of Washington, School of Fisheries.

Flagg, T. A., F. W. Waknitz, D. J. Maynard, G. B. Milner, and C. V. Mahnken. 1995. *The Effect of Hatcheries on Native Coho Salmon Populations in the Lower Columbia River.* Am. Fish. Soc. Symp. 15:366-375.

Fleming, I. A. and M. R. Gross. 1990. Latitudinal Clines: Trade-off between Egg Number and Size in Pacific Salmon. *Ecology* 71(1):1-11.

Foley, S. 2/12/04 , 2/20/04, and 4/14/04. District 12 Fish Biologist for WDFW, telephone comm., 2/12/04, 2/20/04, and 4/14/04) with Paul LaRiviere, HDR Engineering.

Fraley, J. J. and B. B. Shepard. 1989. Life history, ecology and population status of migratory bull trout (Salvelinus confluentus) in the Flathead Lake and River system, Montana. Northwest Science 63(4): 133-143.

Godfrey, H. 1965. Coho Salmon in Offshore Waters. In: *Salmon of the North Pacific Ocean.* Part IX. Coho, chinook and masu salmon in offshore waters. Int. North Pac. Fish. Comm. Bull 16. pp 1-39.

Goetz, F. 1989. Biology of the bull trout (Salvelinus confluentus), literature review. Willamette National Forest, Eugene, OR.-

Gribanov, V. I. 1948. *The Coho Salmon (Oncorhynchus kisutch Walb.):- a Biological Sketch.* Izv. Tikhookean. Nauchno-Issled. Inst. Rybn. Khoz. Okeanogr. 28:43-101. (Translated from Russian Fish Res. Board Canada Transl. Ser. 370).

Healey, M. C. 1983. Coastwide Distribution and Ocean Migration Patterns of Stream-type and Ocean-type Chinook Salmon. *Canadian Field-Naturalist* 97:427-433.

Healey, M. C. 1986. Optimum Size and Age at Maturity in Pacific Salmon and Effects of Size-selective Fisheries. In: D. J. Meerburg (ed.), *Salmonid Age at Maturity,* pp. 39-52. Can. Spec. Publ. Fish. Aquat. Sci. 89.

Healey, M. C. 1991. The Life History of Chinook Salmon *(Oncorhynchus tshawytscha).* In: C. Groot and L. Margolis eds., *Life History of Pacific Salmon*, p. 311-393. Univ. BC Press, Vancouver, British Columbia, Canada.

Hoar, W. S. 1951. The Behaviour of Chum, Pink and Coho Salmon in Relation to Seaward Migration. J. Fish. Res. Board Can. 8:241-263.

Johnsgard, P. A. 1990. *Hawks, eagles and falcons of North America.* Smithsonian Institution Press. Washington, D. C.

Keister, G. P. and R. G. Anthony. 1983. Characteristics of bald eagle communal roosts in the Klamath Basin, Oregon and California. J. Wild. Manage: 47(4): 1072-1079

Kerwin, J. 2001. Salmon and Steelhead Habitat Limiting Factors Report for the Cedar-Sammamish Basin. Water Resource Inventory Area 8. Washington Conservation Commission, 31 pp.

KCDNR (King County Department of Natural Resources) 2000. *Literature Review and Recommended Sampling Protocol for Bull Trout in King County.* Final Draft, June 12, 2000. 42 pp.

King County. 1999. GIS database.

King County. 2001. *Reconnaissance Assessment Report – WRIA 8.* King County Department of Natural Resources. Unpublished draft.

King County. 2000a. *Habitat Limiting Factors and Reconnaissance Report Executive Summary*: WRIA 9. King County Department of Natural Resources. 902 pp.

King County. 2002. 2001 Volunteer Salmon Watcher Program in the Lake Washington Watershed and Central Puget Sound Drainages. King County Department of Natural Resources and Parks. June 2002.

King County. 2003. 2002 Volunteer Salmon Watcher Program in the Lake Washington Watershed and Central Puget Sound Drainages. King County Department of Natural Resources and Parks. June 2003.

Klein, R. D. 1979. Urbanization and Stream Quality Impairment. *Water Resources Bulletin* 15:948-963.

Knight, S. K. and R. L. Knight. 1983. *Aspects of food finding by wintering bald eagles.* The Auk. 100:477-484

Koski, K. V. 1966. The Survival of Coho Salmon (Oncorhynchus kisutch) from Egg Deposition to Emergence in Three Oregon Coastal Streams. M.Sc. Thesis. Oregon State University, Corvallis, Oregon. 84 pp.

Kraemer, C. 1999. Habitat Biologist. Washington Department of Fish and Wildlife. Personal communication. Telephone conversation with Dave Des Voigne, HDR Engineering, September 1999.

Kraemer, C. 1999. Habitat Biologist. Washington Department of. Fish Wildlife. Personal communication. Telephone conversation with Dave Des Voigne, HDR Engineering. October 14, 1999.

Limited Factors Analysis. Water Resource Inventory Area 8; Cedar/Sammamish Watersheds.

Ludwa, Kenneth, Lucchetti, G., Fresh, K., and Walter, K., 1997. *Assessing Stream-Dwelling Fishes in Basins of the Lake Washington Watershed, Summer 1996.* King County Department of Natural Resources, Washington Department of Fish & Wildlife, and Muckleshoot Indian Tribe Fisheries Department, 25 pp.

May, C. 1996. Assessment of Cumulative Effects of Urbanization on Small Streams in the Puget Sound Lowland Ecoregion: Implications for Salmonid Resource Management. University of Washington MS Thesis 383 pp.

May, C. W., E. B. Welch, R. R. Horner, J. R. Karr and B. W. Mar. 1997. Quality Indices for Urbanization Effects in Puget Sound Lowland Streams. Washington Department of Ecology. *Water Resources Series Technical Report No. 154.* Seattle, WA.

McLeay, D., I. Birtwell, G. Hartman, and G. Ennis. 1987. Responses of Arctic Grayling (Thymallus arctucus) to Acute and Prolonged Exposure to Yukon Placer Mining Sediment. *Canadian Journal of Fisheries and Aquatic Sciences.* 44:658-673.

Meier, H. H. and N. D. Horseman. 1977. *Field Bioassay Studies on the Tolerances of Juvenile Salmonids to Various Levels of Suspended Solids.* FRI-UW-7713. University of Washington School of Fisheries, Fisheries Research Institute. Seattle, WA.

Menconi, C. and A. Johnson. 1998. *Bellevue Culvert Inventory.* Report to the City of Bellevue. December 1998.

Moring, J. R., and R. L. Lantz. 1975. The Alsea Watershed Study: Effects of Logging on the Aquatic Resources of Three Headwater Streams of the Alsea River, Oregon. Part I – Biological Studies. Oregon Department of Fish and Wildlife, *Fishery Research Report 9*, Corvallis, OR.

Moyle, P. B. 1976. *Inland Fishes of California.* University of California Press, Berkeley, CA.

Nehlsen, W., J. Williams, and J. Lichatowich. 1991. Pacific Salmon at the Crossroads: Stocks at Risk from California, Oregon, Idaho, and Washington. *Fisheries* 16(2):4-21.

Newcombe, C., and D. MacDonald. 1991. Effects of Suspended Sediments on Aquatic Ecosystems. *North American Journal of Fisheries Management.* 11:72-82.

NMFS (National Marine Fisheries Service). 1996. *Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale.* Environmental and Technical Services Division, Habitat Conservation Branch.

Oliver, C. G. 1979. Fisheries investigations in tributaries of the Canadian portion of the Libby Reservoir. Fish and Wildlife Branch, Kootenai Region.

Ottaway, E. M., and A. Clarke. 1981. A Preliminary Investigation into the Vulnerability of Young Trout (Salmo trutta L.) to Downstream Displacement by High Water Velocities. *Journal of Fish Biology* 19:135-145.

Pfeifer, B. and A. Bradbury. 1992. Evaluation of Game Fisheries of Lake Washington-1980-1990. Part I. *Fisheries Investigations of Lake Washington and Sammamish – 1980-1990.* Washington Department of Wildlife. Unpublished draft report.

PFMC. (Pacific Fishery Management Council). 1998. *Coastal Pelagics Fishery Management Plan.* PFMC. Portland, OR.

PFMC (Pacific Fishery Management Council). 1999. Appendix A. Description and Identification of Essential Fish Habitat, Adverse Impacts, and Recommended Conservation Measures for Salmon. PFMC. Portland, OR.

Pratt, K. L. 1984. *Pend Oreille trout and char life history study.* Idaho Department of Fish and Game. Boise, ID.

Pratt, K. L. 1992. *A review of bull trout life history.* Pages 5-9 In: Howell, P. J. and D. V. Buchanan, Eds. *Proceedings of the Gearhart Mountain bull trout workshop.* Oregon Chapter of the American Fisheries Society, Corvallis, OR.

PSRC (Puget Sound Regional Council). 2001. Destination 2030. Metropolitan Transportation Program for the Central Puget Sound Region. Adopted May 24, 2001. Seattle, WA.

Reiman, B. E. and J. D. McIntyre. 1993. *Demographic and habitat requirements for conservation for bull trout.* USDA Forest Service Intermountain Research Station. General Technical Report INT-302.

Reiman, B. E. and J. D. McIntyre. 1995. *Occurrence of bull trout in naturally fragmented habitat patches of varied size.* Trans. Am. Fish. Soc. Vol. 124 (3): 285-296.

Rousenfell, G. A. and G. B. Kelez. 1940. The Salmon and Salmon Fisheries of Swiftsure Bank, Puget Sound and the Fraser River. *Bull. Bur. Fish.* 48:693-823.

Salo, E. O. and W. H. Bayliff. 1958. Artificial and Natural Production of Silver Salmon (Oncorhynchus kisutch) at Minter Creek, Washington. *Res. Bull. Wash. Dept. Fish.* 4:76 pp.

Sandercock, F. K. 1991. Life History of Coho Salmon (Oncorhynchus kisutch). In: C. Groot and L. Margolis (eds.), *Pacific Salmon Life Histories*, p. 396-445. Univ. British Columbia Press, Vancouver.

Schwarz, A. L. and G. L . Greer. 1984. Response of Pacific Herring, Clupea harengus pallisi, to Some Underwater Sounds. *Can. J. Fish. Aquat. Sci.* 41:1183-1192.

Scott, J. B., C. R. Steward, and Q. J. Stober. 1986. Effects of Urban Development on Fish Population Dynamics in Kelsey Creek, Washington. *Transactions of the American Fisheries Society* 115:555-567.

Simenstad, C. A., B.J. Nightingale, R.M. Thom, and D.K. Shreffler. 1999. Impacts of Ferry Terminals on Juvenile Salmon Migrating along Puget Sound Shorelines – Phase I: Synthesis of State of Knowledge. Prepared by Washington State Transportation Center (TRAC), Seattle, for Washington State Transportation Commission in cooperation with U.S. Department of Transportation, Federal Highway Administration.

Smith, M.R., P. W. Mattocks, Jr. and K. M. Cassidy. 1997. *Breeding birds of Washington State.* Volume 4 in K. M. Cassidy, C.. E. Grue, M. R. Smith and K. M. Dvornich (eds), Washington State gap analysis final report. Publications in Zoology No. 1. Seattle Audubon Society. Seattle, WA

Snohomish County. 1994a. North *Creek Watershed Management Plan.* Snohomish County Public Works: Surface Water Management. 243 pp.

Stalmaster, M. V. 1987. *The bald eagle.* Universe Books, New York, NY. 227 pp.

Stalmaster, M. V., R. L. Knight, B. L. Holder, and R. J. Anderson. 1985. Bald Eagles. Pages 269-290. In Brown, E. R.., tech edit 1985. Management of wildlife and fish habitats in forests of western Oregon and Washington. Part 1 – Chapter Narratives. USDA. US Dept of Agriculture, Pacific Northwest Region, Portland, Oregon. 332 pp.

Stinson, D. W., J. W. Watson and K. R. McAllister. 2001. *Washington State status report for bald eagle.* Washington Department of Fish and Wildlife, Olympia, WA.

Stofel, J. 1998. Biologist. Washington Department of Fish and Wildlife, Olympia, WA. Fax to Wayne Buck, Biota Pacific, February 18, 1998.

The Watershed Company. 1998. *Kirkland's Streams, Wetlands and Wildlife Study.* Prepared for the City of Kirkland's Planning and Community Development Department.

Tripp, D. and P. McCart. 1983. Effects of Different Coho Stocking Strategies on Coho and Cutthroat Trout Production in Isolated Headwater Streams. *Can. Tech. Rep. Fish. Aquat. Sci.* 1212:176 pp.

U. S. Fish and Wildlife Service. 1986. *Recovery plan for the Pacific bald eagle.* USFWS, Portland, Oregon 160 pp.

U. S. Fish and Wildlife Service. 1995. *Bald Eagle* (*Haliaeetus leucocephalus*). U. S. FWS, Division of Endangered Species. Unpublished manuscript. 5 pp.

U.S. Fish and Wildlife Service (USFWS). 1998. A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scale.

Ecology (Washington Department of Ecology). 2004. Preliminary Draft of Washington State's Water Quality Assessment (303[d]) for 2002/2004. http://www.ecy.wa.gov/programs/wq/303d/2002/wria_pdfs/wria8.pdf

Washington Department of Fisheries, Washington Department of Wildlife, and Western Washington Treaty Tribes. 1992. *1992 Washington State Salmon and Steelhead Stock Inventory.* March 1993. 215 pp.

WDFW (Washington Department of Fish and Wildlife). 1998. *Washington State Salmonid Stock Inventory:* Bull Trout/Dolly Varden, 437 pp.

Washington Department of Fish and Wildlife. 1999a. *Bull trout in the Snohomish River System.* WDFW. Mill Creek, Washington.

WDFW (Washington Department of Fish and Wildlife). 1999. Fish Passage Design at Road Culverts: A Design Manual for Fish Passage at Road Crossings. WDFW, Olympia, WA.

WDFW (Washington Department of Fish and Wildlife). 2000. Priority Habitats and Species database.

WDFW (Washington Department of Fish and Wildlife). 2004. Priority Habitats and Species database.

WDFW (Washington Department of Fish and Wildlife). 2004. Salmonscape. http://wdfw.wa.gov/mapping/salmonscape

(WDFW) Washington Department of Fish and Wildlife and (WTIT) Western Washington Treaty Indian Tribes. 1994. *1992 Washington State Salmon and Steelhead Stock Inventory. Appendix One – Puget Sound Stocks.* North Puget Sound Volume. Olympia, WA.

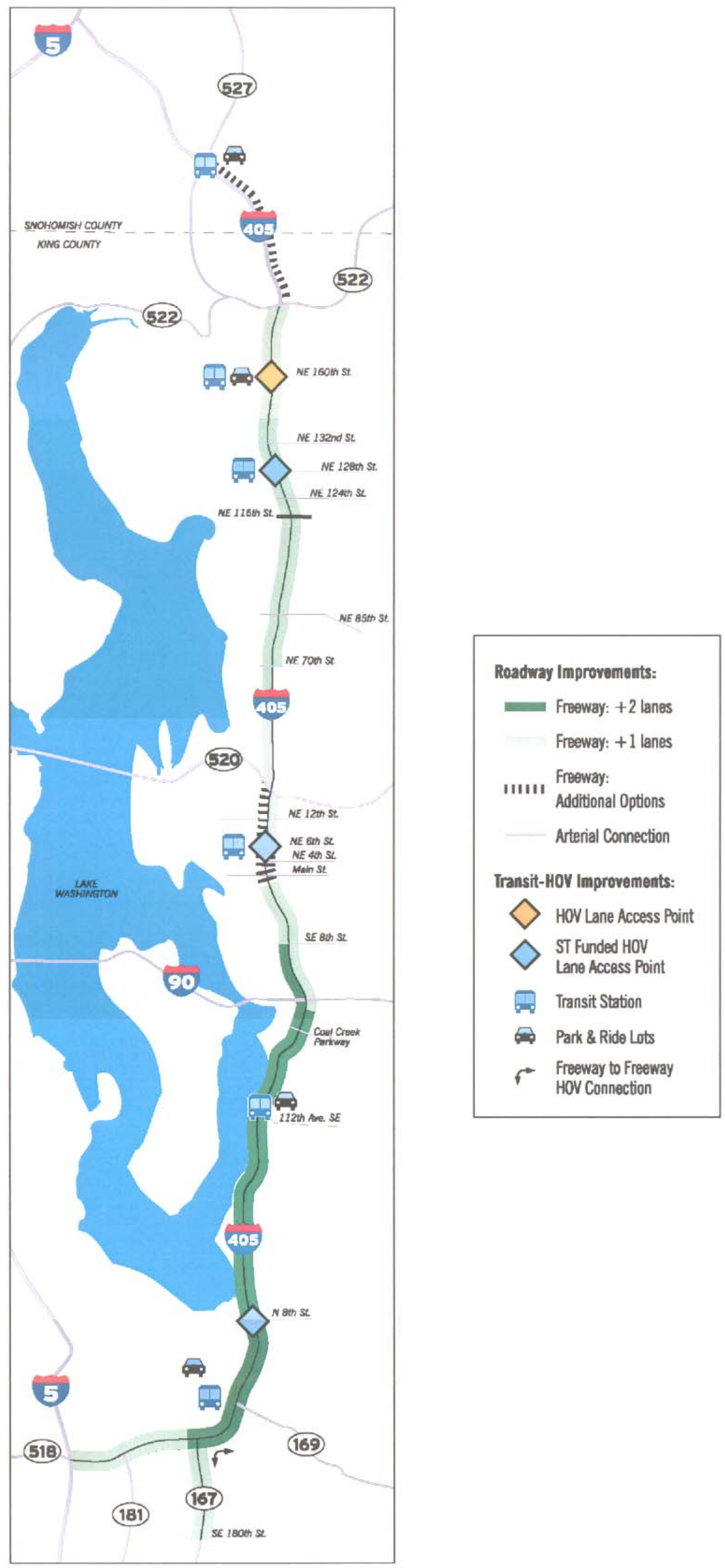
Watson, G. and T. W. Hilman. 1997. Factors affecting the distribution and abundance of bull trout: an investigation at hierarchical scales. North American Journal of Fisheries Management. 17: 237-252.

Williams, R. W., R. M. Laramie and J. J. Ames. 1975. *A Catalog of Washington Streams and Salmon Utilization.* Vol. 1. Puget Sound Region. Washington Department of Fisheries.

WSDOT (Washington State Department of Transportation). 2002. *Biological Assessment Preparation: Advanced Training Manual.* WSDOT, Environmental Affairs Office. January 2002. 310 pp.

WSDOT (Washington State Department of Transportation). 2002. No Effect and Not Likely to Adversely Affect Programmatic Biological Assessment Working Document for NOAA Fisheries Listed Salmonids. WSDOT Environmental Affairs Office. 164 pp.

WSDOT (Washington State Department of Transportation). 2001. I-405 Corridor Program NEPA/SEPA Draft EIS. *Draft Fish and Aquatic Habitat Expertise Report*, Technical Appendix. 174 pp.



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I-405 Congestion Relief and Bus Rapid Transit
FIGURE 1

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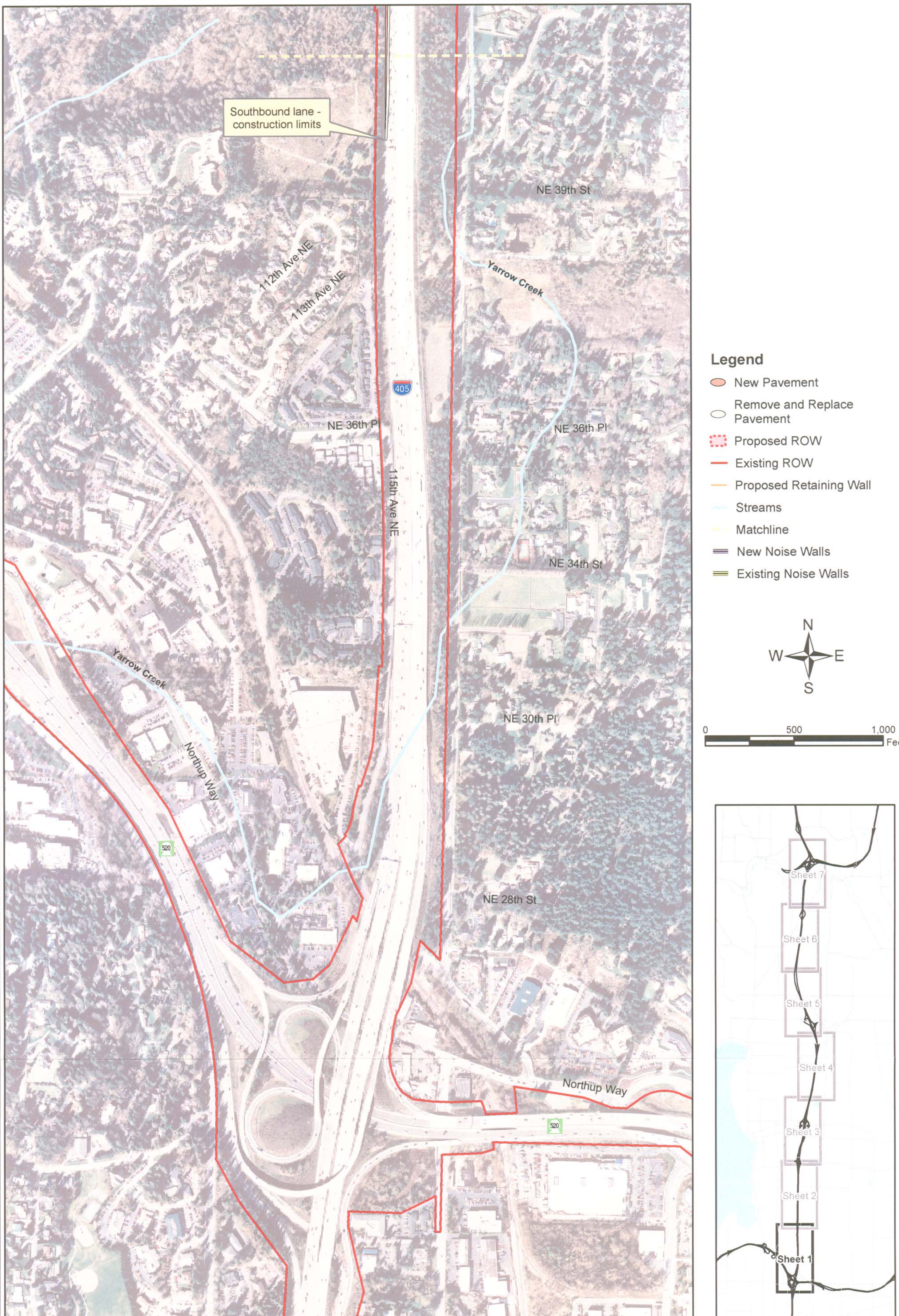
SR522 to SR520 Action Area

FIGURE 2

Source: WSDOT; 2004, King County; 2003 | \\NW_GIS\projects\wash\I_405_2003\map_docs\kirkland\Biological Assessment\SR522-SR520_Fig 3.mxd | Last Updated : 07-22-04



SR522 to SR520 Project Proposed Improvements

FIGURE 3

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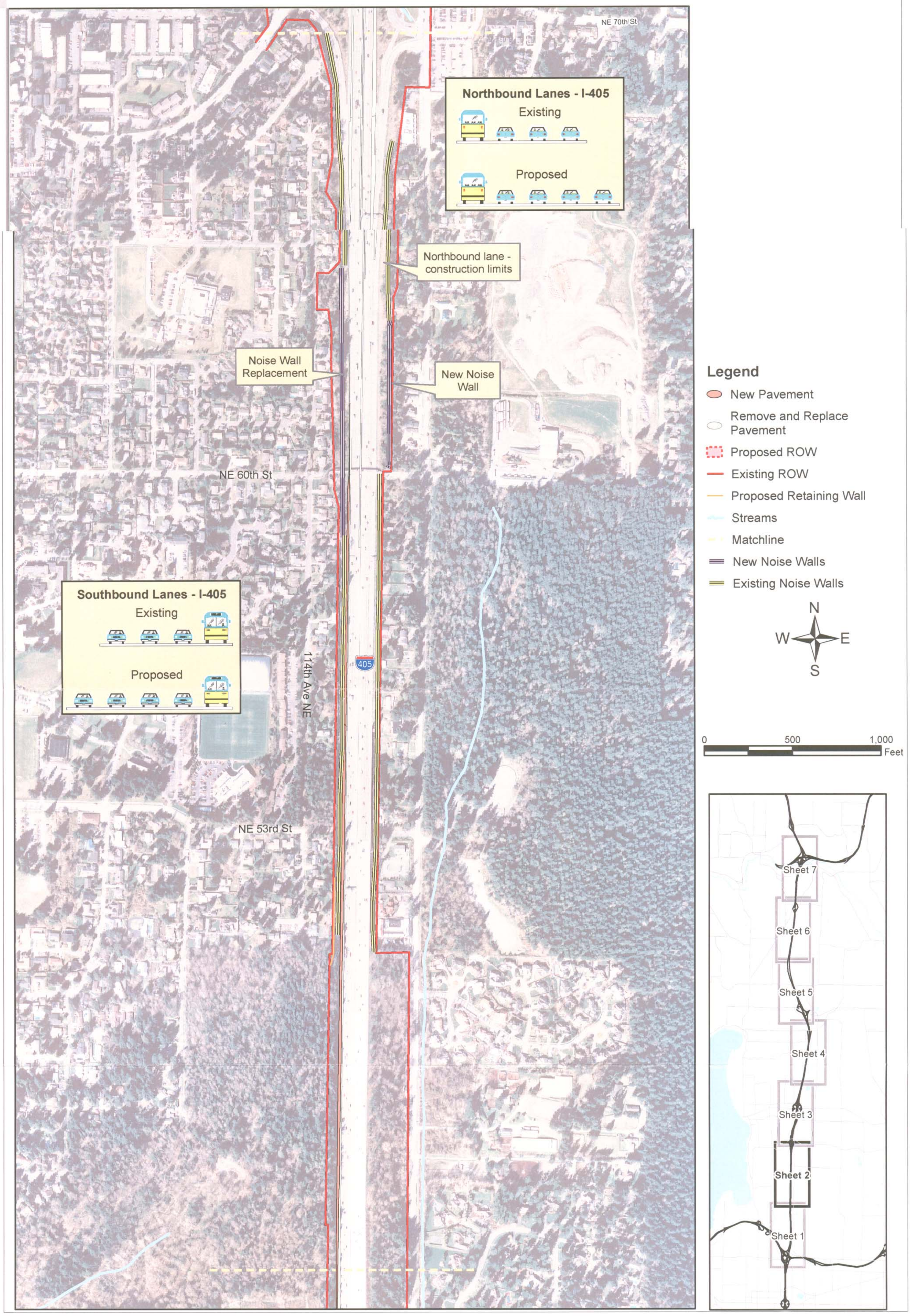
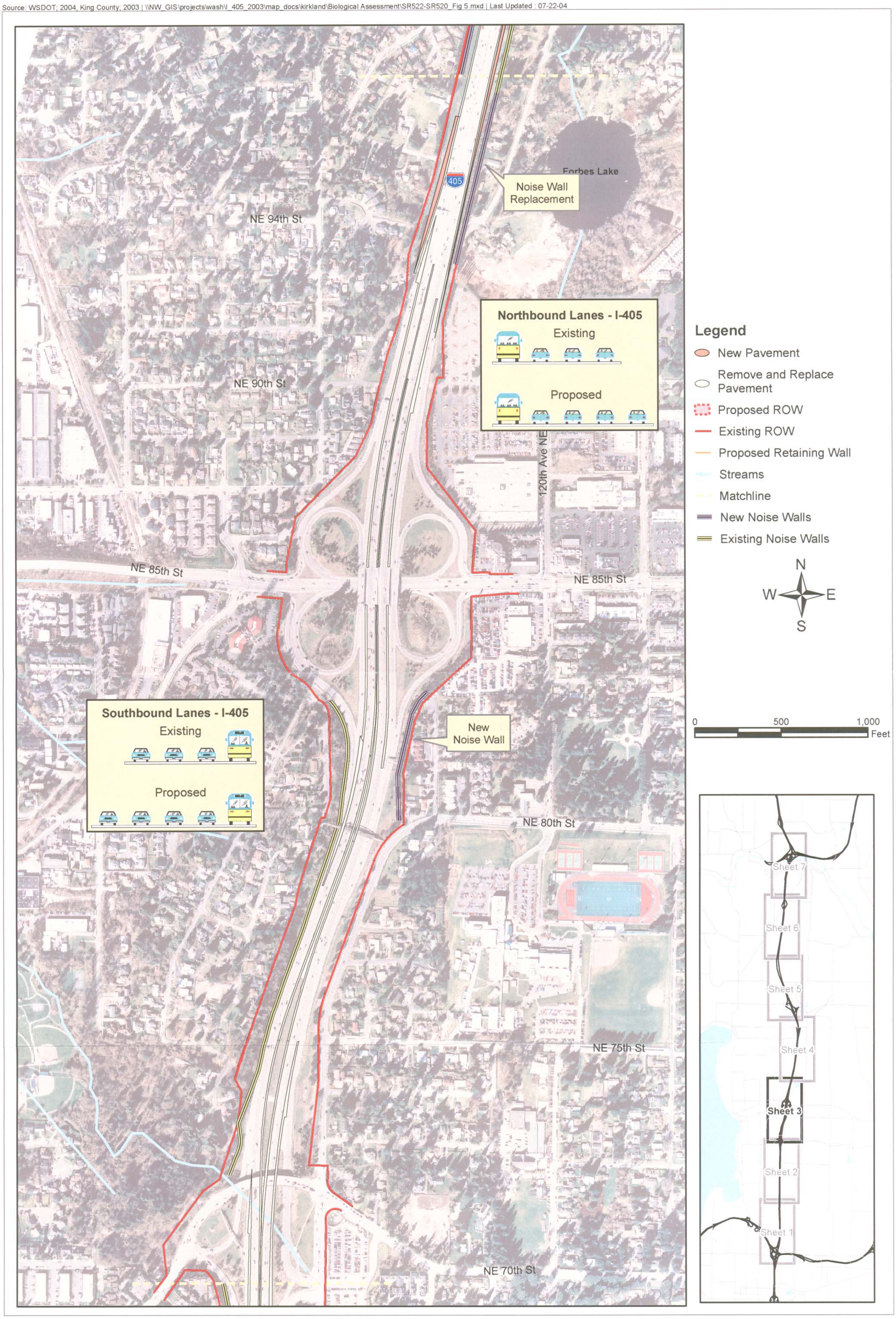


SR522 to SR520 Project Proposed Improvements

FIGURE 4

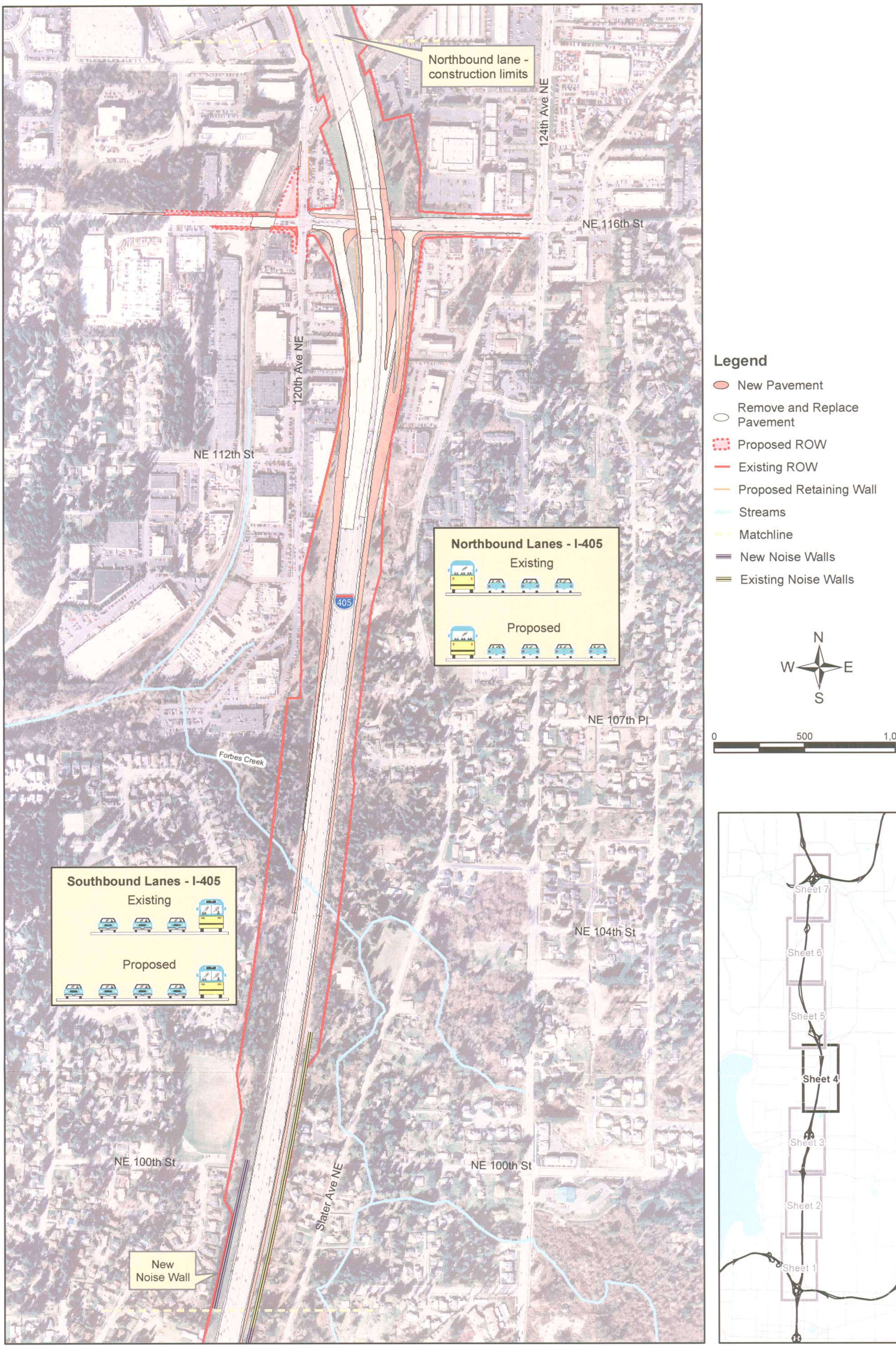
Source: WSDOT; 2004, King County; 2003 | \\NW_GIS\projects\wash\I_405_2003\map_docs\kirkland\Biological Assessment\SR522-SR520_Fig 5.mxd | Last Updated : 07-22-04



SR522 to SR520 Project Proposed Improvements

FIGURE 5

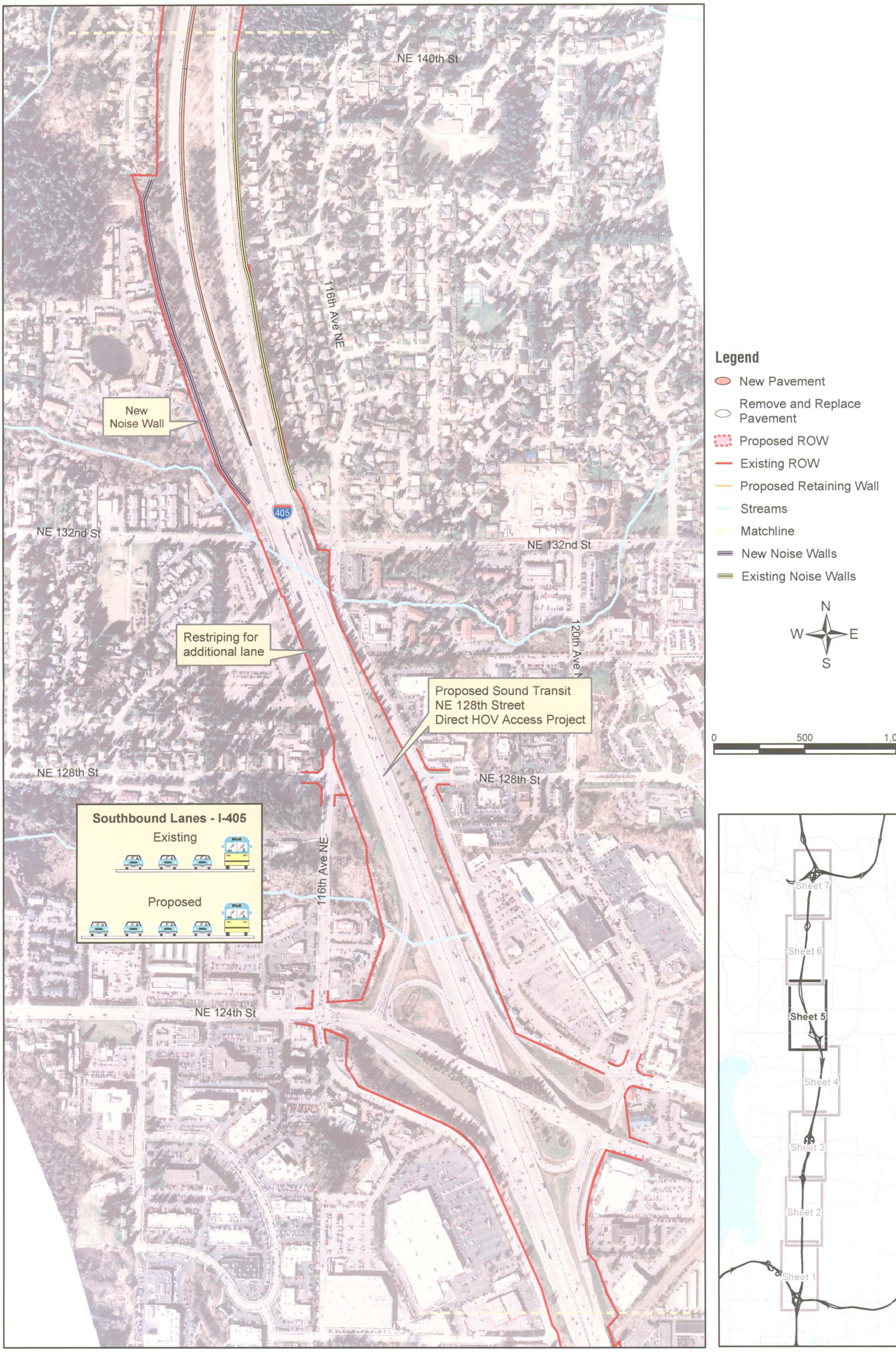
Source: WSDOT; 2004, King County; 2003 | \\NW_GIS\projects\wash\I_405_2003\map_docs\kirkland\Biological Assessment\SR522-SR520_Fig 6.mxd | Last Updated : 07-22-04



SR522 to SR520 Project Proposed Improvements

FIGURE 6

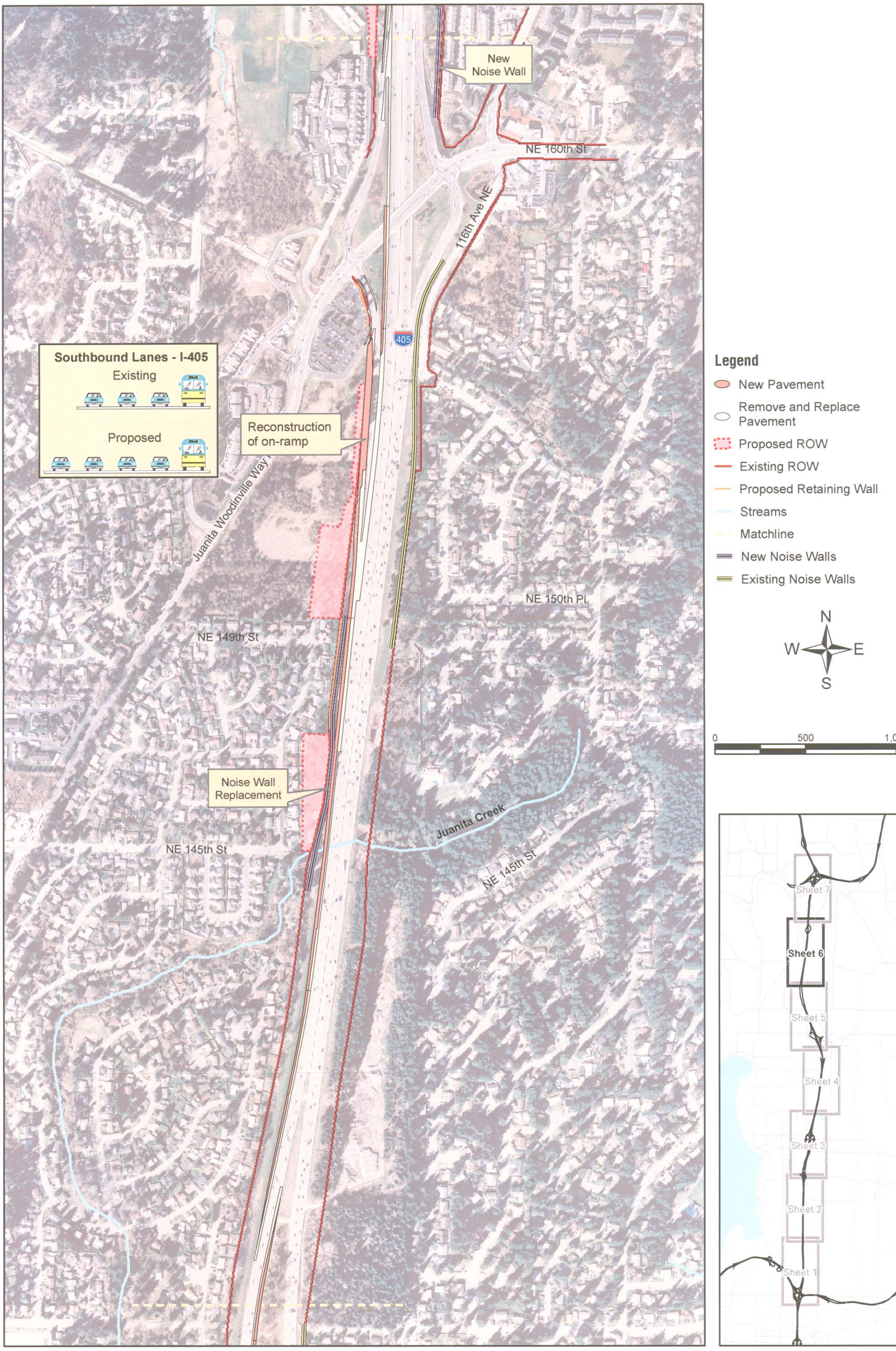
Source: WSDOT; 2004, King County; 2003 | \\NW_GIS\projects\wash\I_405_2003\map_docs\kirkland\Biological Assessment\SR522-SR520_Fig 7.mxd | Last Updated : 07-22-04



SR522 to SR520 Project Proposed Improvements

FIGURE 7

Source: WSDOT; 2004, King County; 2003 | \\NW_GIS\projects\wash\I_405_2003\map_docs\kirkland\Biological Assessment\SR522-SR520_Fig 8.mxd | Last Updated : 07-22-04



SR522 to SR520 Project Proposed Improvements

FIGURE 8

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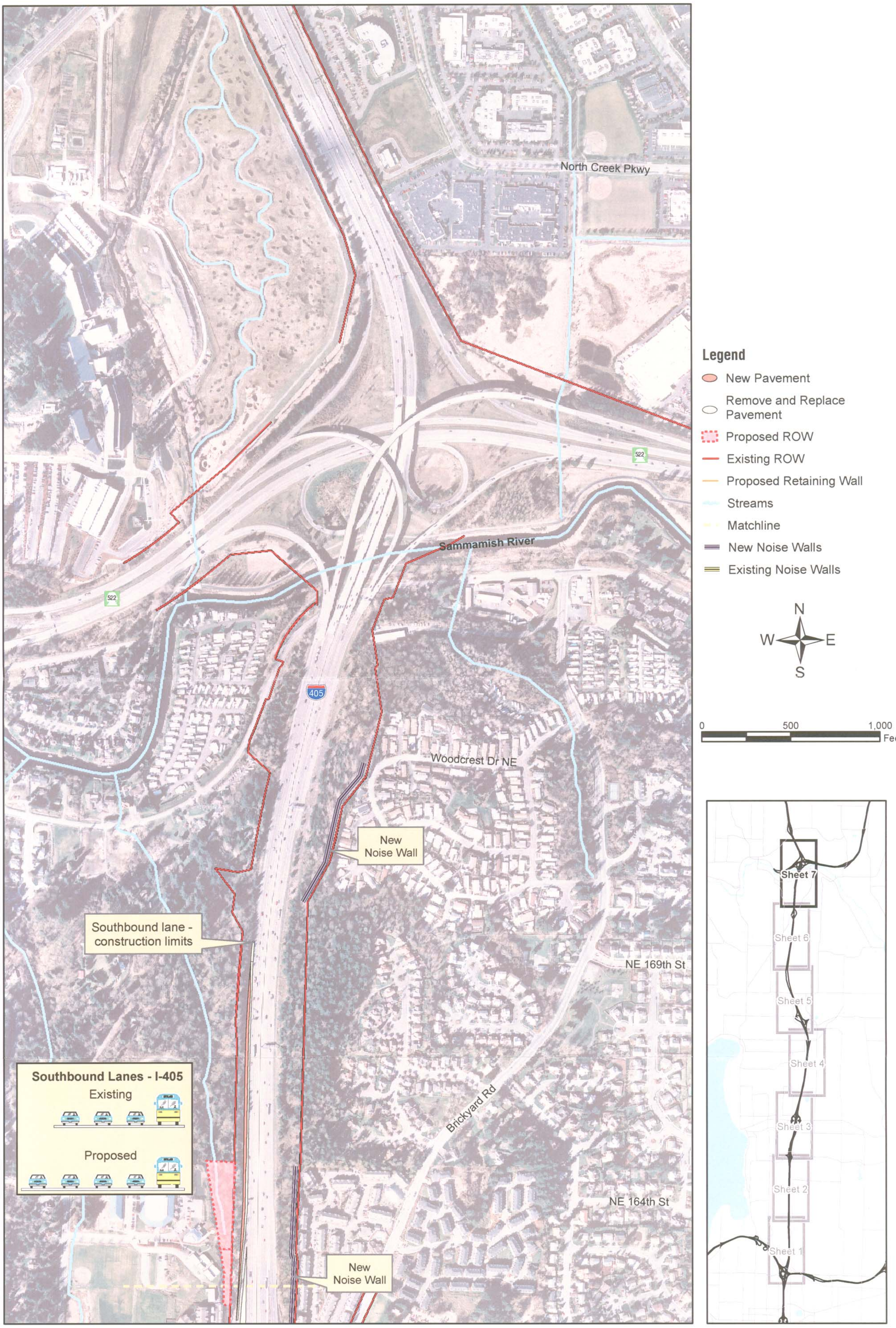
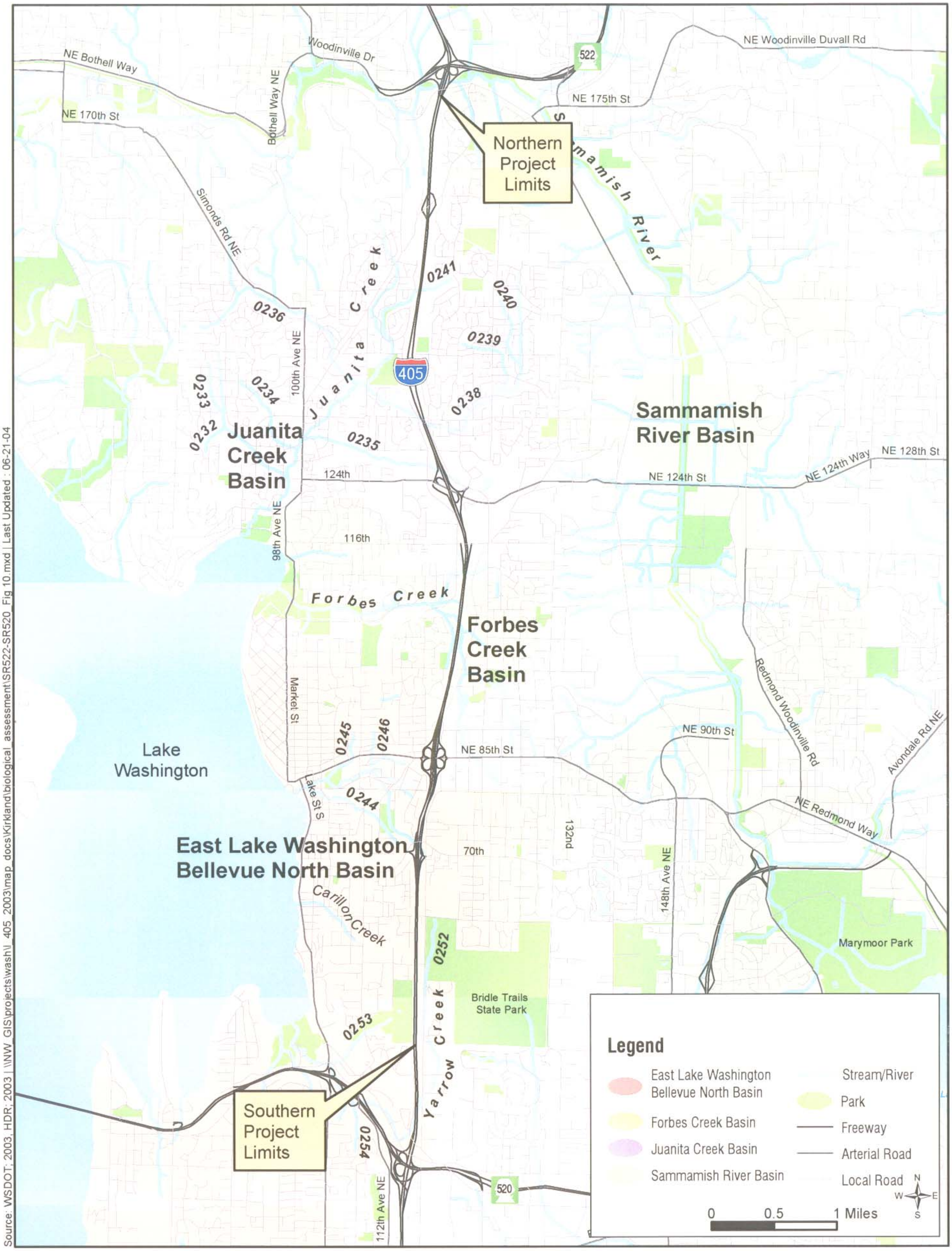


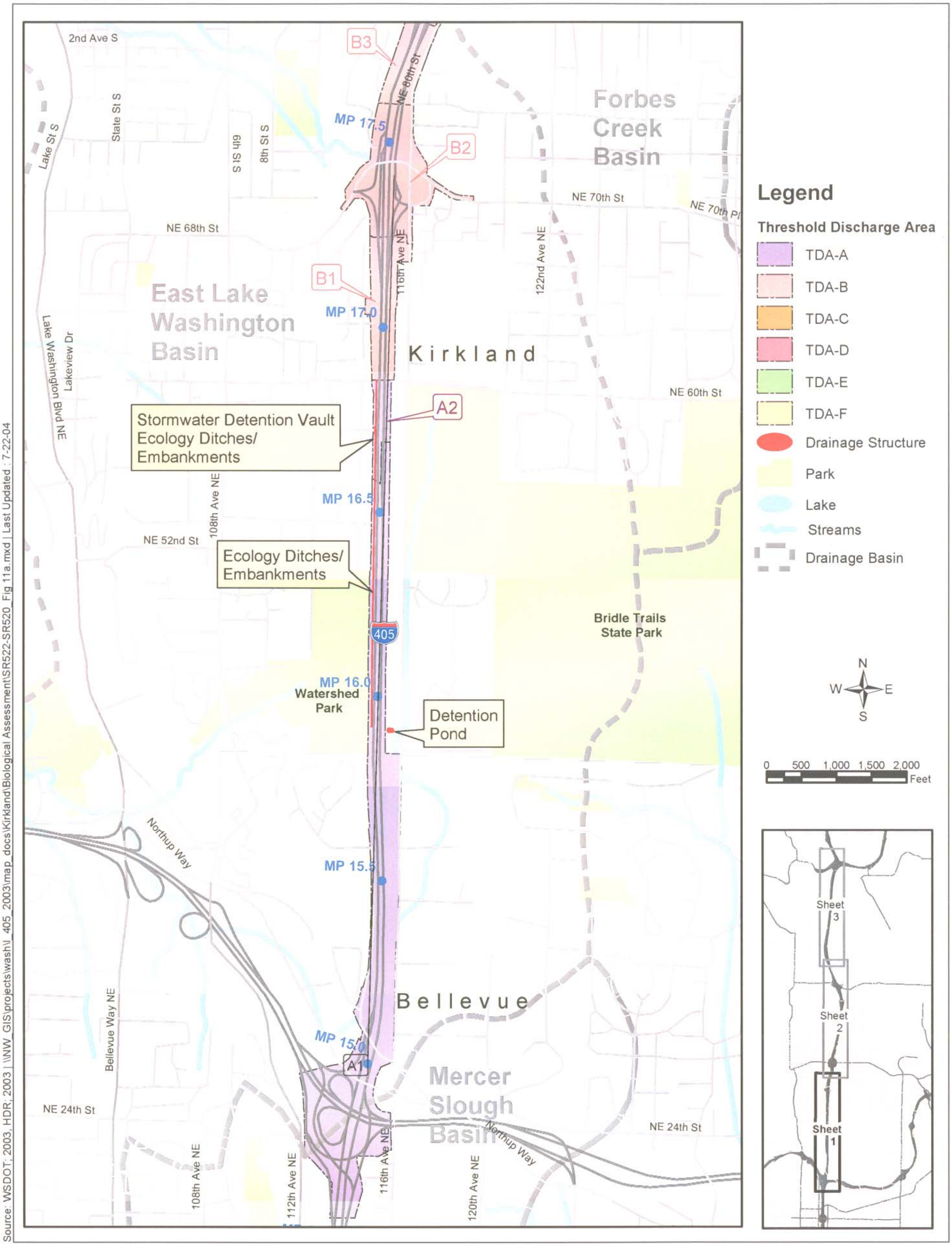
SR522 to SR520 Project Proposed Improvements

FIGURE 9



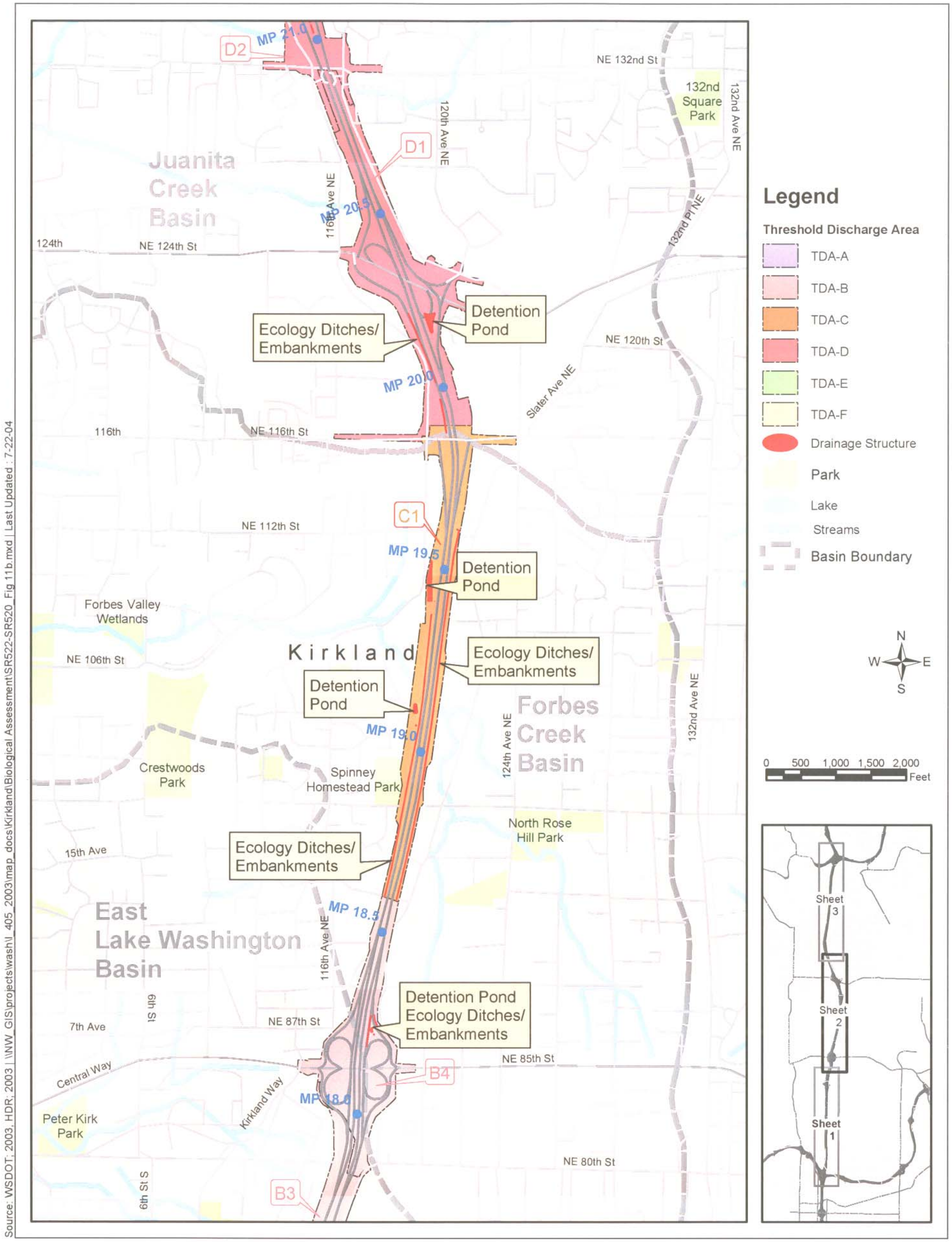
SR522 to SR520 Project Watershed Subbasins

FIGURE 10



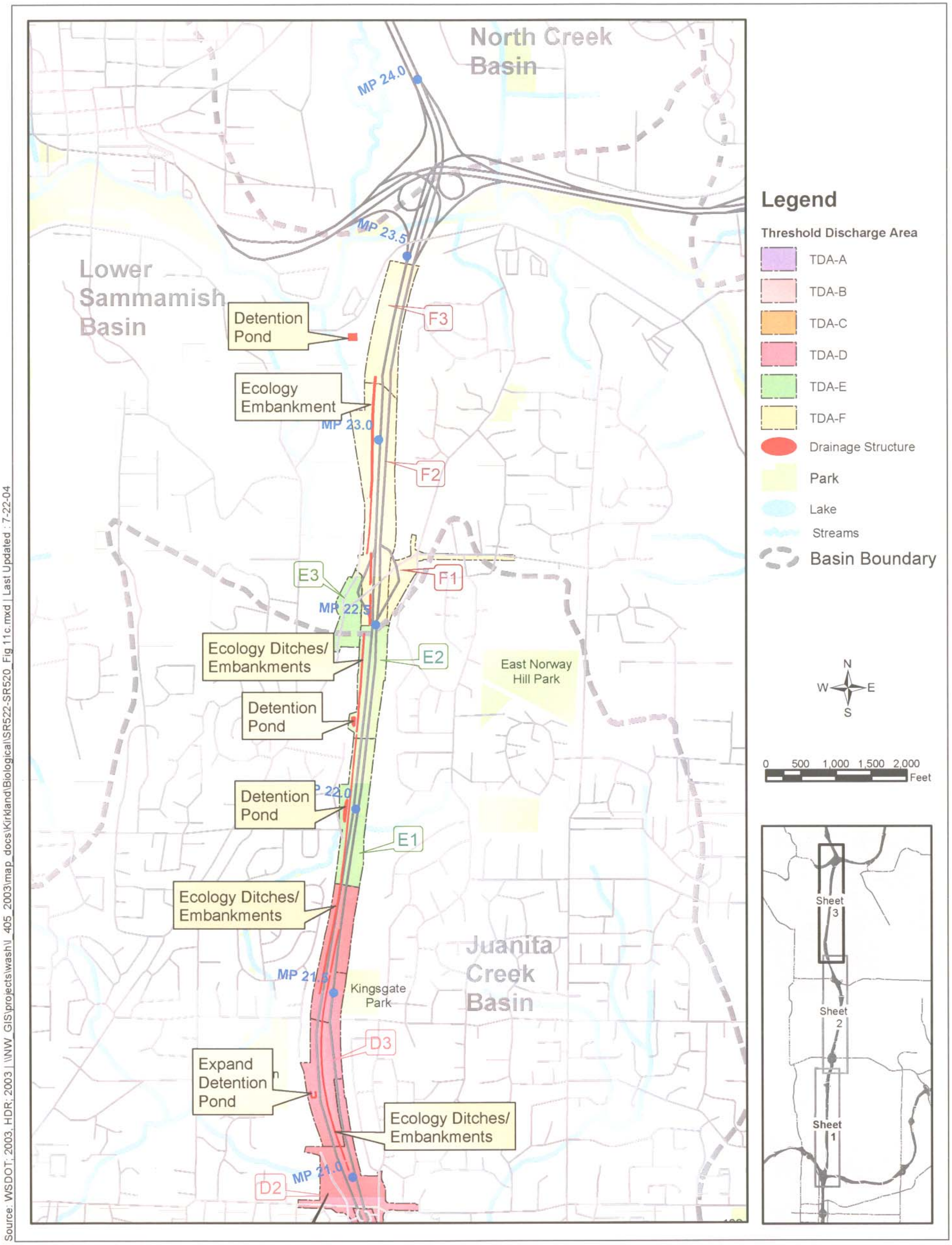
SR522 to SR520 Project Proposed Improvements - Drainage Basins

FIGURE 11a



SR522 to SR520 Project Proposed Improvements - Drainage Basins

FIGURE 11b



SR522 to SR520 Project Proposed Improvements - Drainage Basins

FIGURE 11c

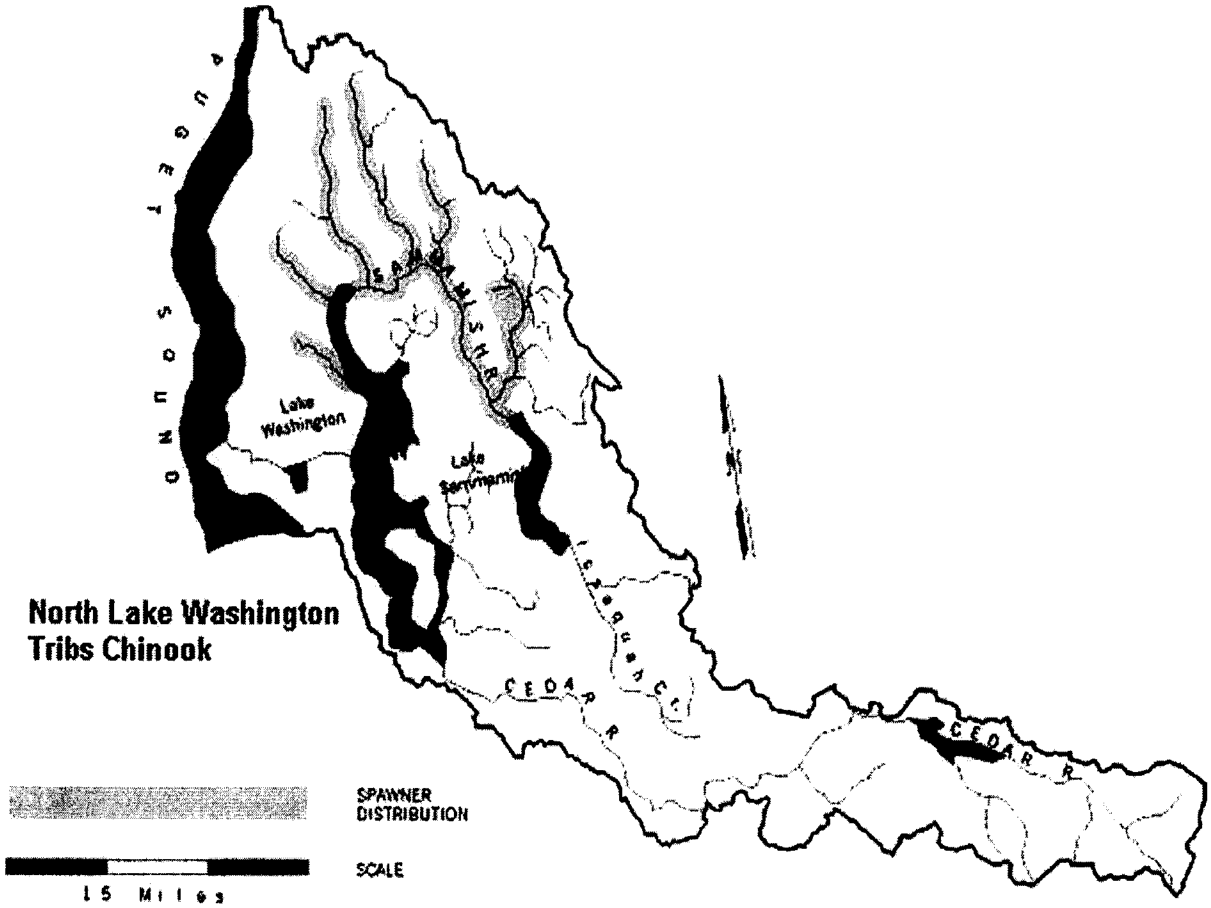


Figure 12. Spawner Distribution and Location of North Lake Washington Tributaries Chinook (adapted from WDFW, 2004 *Salmonscape*).

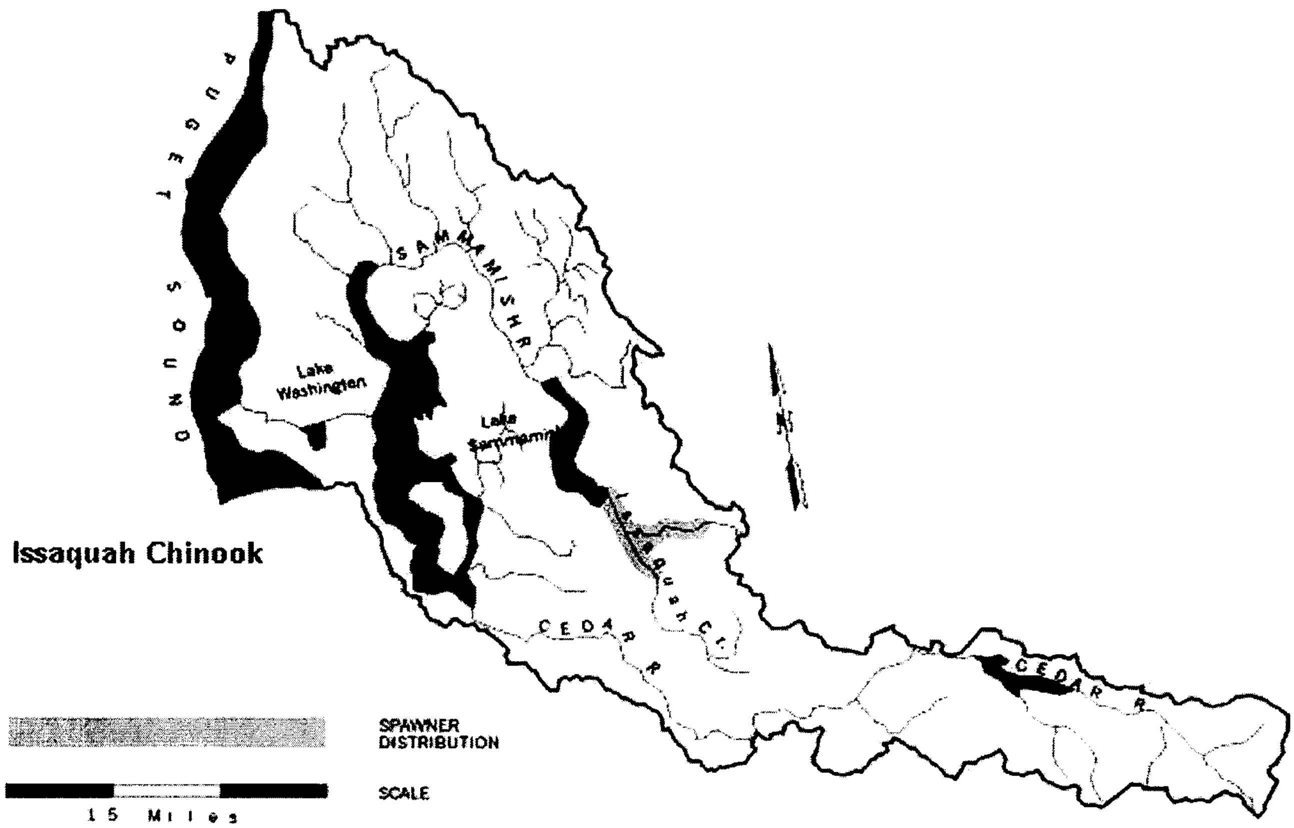


Figure13. Spawner Distribution and Location of Issaquah Creek Chinook (adapted from WDFW, *Salmonscape* 2004).

APPENDIX A: Essential Fish Habitat

The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) includes a mandate that NOAA Fisheries must identify Essential Fish Habitat (EFH) for federally managed marine fish, and that federal agencies must consult with NOAA Fisheries on all activities, or proposed activities, authorized, funded, or undertaken by the agency that may adversely affect EFH. The Pacific Fisheries Management Council (PFMC) has designated Essential Fish Habitat (EFH) for the Pacific Salmon Fishery, federally managed groundfish, and coastal pelagic fisheries (Casillas et al., 1998; PFMC, 1999).

Salmonids

The EFH designation for the Pacific Salmon Fishery includes all those streams, lakes, ponds, wetlands, and other water bodies currently or historically accessible to salmon in Washington, Oregon, Idaho, and California, except above the impassible barriers identified by PFMC (1999). In the estuarine and marine areas, designated EFH for salmon extends from nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone offshore of Washington, Oregon, and California north of Point Conception (PFMC, 1999).

The Pacific salmon management unit (the North Pacific salmon stocks off the coasts of Washington, Oregon, and Idaho) includes chinook (*Oncorhynchus tshawytscha*), coho (*Oncorhynchus kisutch*), and pink salmon (*Oncorhynchus gorbuscha*). Two of these species (chinook and coho) use the Lake Washington hydrologic unit (watershed) for adult migration, juvenile out-migration, and rearing where suitable habitat is present.

Determination of Effects on EFH

Since there are no pink salmon in the Lake Washington watershed, this project will have *no impact* on pink salmon. For reasons discussed above, this project will have *no impact* on chinook, coho salmon or pink salmon essential fish habitat.